VPDES PERMIT FACT SHEET

This document gives pertinent information concerning the reissuance of the VPDES permit listed below. This permit is being processed as a minor, municipal permit. The effluent limitations contained in this permit will maintain the Water Quality Standards of 9 VAC 25-260 et seq. The discharge results from the operation of a sewage treatment plant at a private school. This permit action consists of updating the permit to reflect changes in the Water Quality Standards, Guidance Memos, and the VPDES Permit Manual. SIC Code: 8211.

1.	**Facility Name:**	Blessed Sacrament – Huguenot Academy	
	Address:	2501 Academy Road Powhatan, VA 23139	
	Location	2501 Academy Road Powhatan, VA 23139	
2.	**Permit Number**	VA0063037	
	Existing Permit Expiration Date:	December 25, 2008	
3.	**Owner Contact**		
	Name:	Mr. James Fortune	
	Title:	President	
	Telephone No:	804-598-4211	
4.	**Application Complete Date:**	July 31, 2008	
	Permit Drafted By:	Jaime Bauer, Piedmont Regional Office	
	Reviewed By:	Tamira Cohen	**Date:** September 8, 2008
	Reviewed By:	Curt Linderman	**Date:** November 3, 2008
	Public Notice		
	Name of Paper:	Powhatan Today	
	Dates:	First Publication Date: November 19, 2008 Second Publication Date: November 26, 2008	
	Public Comment Period:	November 19, 2008 through December 19, 2008	

5. **SCC Certification Verification as required by Section 62.1-44.15:3 of the State Water Control Law:** Applies only to privately owned treatment works that treat sewage generated by private residences.

6. **Financial Assurance/Closure as required by 9 VAC 25-650-10:** Applies only to privately owned treatment works that treat sewage generated by private residences with design flows between 1,000 gpd and 40,000 gpd. This facility is a private school not a residence; therefore, financial assurance is not required.

7.	**Receiving Stream Name:**	Unnamed Tributary of Branch Creek			
	Basin:	James River (Middle)			
	Section:	10a			
	Class:	III			
	Special Standards:	PWS – This discharge is approximately 18.9 miles upstream of the Henrico Regional water treatment plant raw water intake on the James River.			
	River Mile:	2-XJG000.19			
	7-Day, 10-Year Low Flows:	0	MGD	0	cfs
	1-Day, 10-Year Low Flows:	0	MGD	0	cfs
	30-Day, 5-Year Low Flows:	0	MGD	0	cfs
	30-Day, 10-Year Low Flows:	0	MGD	0	cfs

7-Day, 10-Year High Flows:	0	MGD	0	cfs
1-Day, 10-Year High Flows:	0	MGD	0	cfs
30-Day, 10-Year High Flows:	0	MGD	0	cfs
1-Q30 Flows	0	MGD	0	cfs
Harmonic Mean Flow:	0	MGD	0	cfs
Tidal:	No			
On 303(d) List:	No			

See Flow Frequency Memo August 12, 2008 (Attachment 1)

8. **Operator License Requirements**: (9 VAC 25-790-300)
   No operator is currently required. However, upon facility upgrade Class IV operator is required.

9. **Reliability Class**: (9 VAC 25-790-70)
   Class II. The facility will be required to meet a Reliability Class I upon facility upgrade.

10. **Permit Characterization:**

X Private ___ Federal ___ State _ POTW X PVOTW

___ Possible Interstate Effect ___ Interim Limits in Other Document

11. **Table 1: Wastewater Flow and Treatment**

Outfall Number	Discharge Source	Treatment	Flow Design Capacity
001	Private (Catholic) School	Stabilization Lagoon	0.004 MGD

(See Attachment 2 for facility diagram)
The facility is currently operating as a no discharge lagoon. If and when a discharge occurs, the facility must meet the effluent limitations outlined in Part I.A of the permit. It is assumed that the current treatment system, a stabilization lagoon, will not consistently produce an effluent that complies with all the limitations in Part I.A., and chlorination, dechlorination, and post aeration systems will have to be provided. Therefore, if discharge occurs, new treatment facilities will be needed. As indicated in the appropriate special condition, the upgraded facility will require a certified operator and will have to be constructed to meet stated reliability requirements. Construction of treatment facilities will not require modification of the permit as long as the design capacity of the upgrade is 4,000 gallons per day or less. In a letter dated July 24, 2008, which included supplemental application information, Mr. James Fortune indicated that the facility has received approval from the DEQ OWE for installation of a UV treatment system in case of an overflow of the lagoon. They now believe a more energy efficient option is to install a chlorination (tablet) feed system followed by a de-chlorination feed system. Updated design plans are being prepared for submittal to the DEQ. This permit contains chlorine limitations and monitoring that will be applicable to the new system. It is assumed that discharge will be continuous once an initial discharge occurs.

12. **Sewage Sludge Use or Disposal:**
   The sludge is stored in the lagoon, and the lagoon has not had to be pumped. When sludge disposal is necessary, the school has made arrangements to have it pumped and hauled to Powhatan County Dutoy Creek WWTP, according to the sludge application.

13. **Discharge Location Description**:
   The facility discharges to an unnamed tributary of Branch Creek. See Attachment 3 for the Powhatan Quadrangle topographic map, 128C.

14. **Material Storage**:
No materials currently stored on site. A special condition has been included in the permit requiring proper storage of materials when applicable.

15. **Ambient Water Quality Information**: Due to the intermittent nature of the tributary, wastewater residing within the lagoon were sampled to satisfy the data requirement in the Form 2A application and were used as ambient water quality data for wasteload calculations and permit limitation development per the advice of J. Palmore, Senior Environmental Engineer Planning Staff.

16. **Antidegradation Review & Comments:** **Tier 1** __X__ **Tier 2** ______ **Tier 3** ______
The State Water Control Board's Water Quality Standards includes an antidegradation policy (9 VAC 25-260-30). All state surface waters are provided one of three levels of antidegradation protection. For Tier 1 or existing use protection, existing uses of the water body and the water quality to protect these uses must be maintained. Tier 2 water bodies have water quality that is better than the water quality standards. Significant lowering of the water quality of Tier 2 waters is not allowed without an evaluation of the economic and social impacts. Tier 3 water bodies are exceptional waters and are so designated by regulatory amendment. The antidegradation policy prohibits new or expanded discharges into exceptional waters.

The antidegradation review begins with a Tier determination. The receiving stream, an UT to Branch Creek, is considered to be a Tier 1 water body because it is a dry ditch. This determination is based on the intermittent nature of the stream where beneficial uses cannot be fully attained. The unnamed tributary was not assessed during the 2006 or draft 2008 305(b)/303(d) Water Quality Assessments and the waters are therefore considered Category 3A.

17. **Site Inspection**: By: Jaime Bauer on December 9, 2008. (See Attachment 5)

18. **Effluent Screening & Limitation Development**:

EFFLUENT CHARACTERISTICS	BASIS FOR LIMITS	DISCHARGE LIMITATIONS					
		MONTHLY AVERAGE		WEEKLY AVERAGE		MIN	MAX
Flow (MGD)	NA	NL		NA		NA	NL
pH (standard units)	1,2	NA		NA		6.0	9.0
BOD_5	1, 2	30 mg/L	450 g/d	45 mg/L	680 g/d	NA	NA
TSS	2	60 mg/L	910 g/d	90 mg/L	1400 g/d	NA	NA
TRC	1	0.0080 mg/L		0.0098 mg/L		NA	NA
Dissolved Oxygen	1	NA		NA		5.0 mg/L	NA
Ammonia as N (final)	1	5.4 mg/L		5.4 mg/L		NA	NA
E. coli	3	126 Geometric Mean		NA		NA	NA

1. Water Quality Based Limit 2. Federal Effluent Guideline 3. Other

Permit limitation development for toxic pollutants began with obtaining flow frequency and stream data from the DEQ water planning staff. Since the facility will potentially discharge to an intermittent stream where the effluent is the stream, 100% mix was assumed and used in the MSTRANTI spreadsheet. As previously indicated, the facility has not had a discharge; therefore, there is no effluent data available for use in computing effluent limitations. Water quality data of pH from samples obtained from wastewater residing in the lagoon and submitted with the Form 2A application was used in limitation development in lieu of effluent data. A temperature of 28°C was assumed and used for effluent temperature since no effluent temperature was available. This is believed to be a conservative assumption based data from similar facilities. The mixing ratios, Form 2A data, stream data, and flow frequencies were entered into the MSTRANTI spreadsheet to calculate Wasteload Allocations (WLA). Hardness for both stream and effluent data fields in MSTRANTI was assumed to be 25 mg/L based on a conservative best professional judgment since no other data was available. See Attachment 4 for permit limitation development documents.

pH: A pH range of 6.0 – 9.0 Standard Units is assigned to all Class III waters per the Virginia Water Quality Standards, 9 VAC 25-260-50 and federal effluent limit guidelines for secondary treatment (40 CFR 133.102).

Limitation Determination for Biological Oxygen Demand (BOD_5) and Total Suspended Solids (TSS) for Waste Stabilization Ponds: Section MN-2 of VPDES Permit Manual was used to determine the applicable permit limitations. BOD_5 and TSS data from samples obtained from wastewater residing in the lagoon that was submitted with the application are below:

	Application Sample 1	**Application Sample 2**
BOD5	21.5	144.0
TSS	107.6	117.0

It is the best professional judgment of staff that the facility will be capable of meeting secondary limitations for BOD_5. In order to meet the ammonia limitation of 4.5 mg/L, the facility will need to install treatment such as aeration which will facilitate the facility being able to meet the secondary BOD_5 standard of 30 mg/L. In addition, the July 15, 1997 Stream Sanitation Analysis (Attachment 7) prescribes a BOD5 limitation of 30 mg/L to protect water quality. However, staff does not believe the facility will be able to meet the secondary standards for TSS. Following the flow chart for TSS limitation determination, facilities using waste stabilization ponds for treatment that cannot meet TSS limitations of 30 mg/L or 45 mg/L are to be assigned equivalent to secondary standards of 60 mg/L monthly average if located east of the Blue Ridge Mountains. Secondary limits and equivalent secondary limits are based on the federal effluent limit guidelines for secondary treatment (40 CFR 133).

Total Residual Chlorine (TRC): A limitation evaluation was conducted for TRC. The chronic and acute WLAs were calculated using the MSTRANTI Excel Spreadsheet. Acute and chronic WLA for TRC were calculated as 0.0019 mg/L and 0.0011 mg/L, respectively. Following the procedures in GM 00-2011, since the WLAa was less than 4.0 mg/L, the actual WLA were entered into STATS.exe to determine the need for a permit limitation and calculate the limitation. A quantification level of 0.10 mg/L and a data point of 20 mg/L were used as recommended by the VPDES permit manual. The evaluation produced recommended limitations of 0.0080 mg/L for average monthly and 0.0098 mg/L for average weekly in order to protect water quality (See Attachment 4).

Dissolved Oxygen (DO): Based on the July 15, 1977 Memorandum. See Attachment 7. The minimum DO criteria for class III waters in the Virginia Water Quality Standards (WQS) is 5.0 mg/L.

Ammonia: A limitation evaluation was conducted for ammonia using the MSTRANTI Excel Spreadsheet to calculate acute and chronic WLAs. The WLAs are entered in to the STATS.exe computer application to determine the need for a permit limitation and calculate the limitation.. Acute and chronic WLAs of 45 mg/L and 2.7 mg/L, respectively, were entered into STATS.exe with a quantification level of 0.20 mg/L. The procedures established in Virginia DEQ Guidance Memo 00-2011 recommend inputting a single datum point of 9.0 mg/L into the program. The evaluation resulted in a recommended permit weekly and monthly average limitation of 5.4 mg/L. See Attachment 4.

E. coli: The facility received an E. coli wasteload allocation of 6.96E+9 cfu/yr in the James River and Tributaries –Lower Piedmont Region TMDL report. The wasteload allocation is based on the facility's permitted flow of 0.004 MGD and an E. coli count of 126 N/100 mL. The frequency of 2 per Month requires that each sample be separated by at least 7 days.

19. **Basis for Sludge Use & Disposal Requirements:**
A sludge management plan for the pump and haul disposal of sludge from this facility is required

according to 9 VAC 25-31-100 P. At present, sludge has never been removed from the lagoon. However, the facility has arranged for sludge disposal at the Powhatan County Dutoy Creek WWTP when necessary. Therefore, No sludge monitoring or limitations apply to this facility.

20. **Antibacksliding Statement**:
9VAC 25-31-220.L and DEQ Guidance Memo 00-2011 do not allow re-issued permits to contain a less stringent water-quality based effluent limitation, unless under certain specified exceptions. All limitations are at least as stringent as in the previous permit with the exception of ammonia.

In the previous permit issuance, an effluent temperature of 32°C was assumed. However, based on data from similar operating lagoon systems located in the same geographic region, it is more appropriate to assume an effluent temperature of 28°C. Since new information is available that was not available at the time the permit was previously issued, backsliding is not occurring.

21. **Special Conditions:**

B. Additional Chlorine Limitations and Monitoring Requirements
Rationale: Required by VA Water Quality Standards, 9 VAC 25-260-170 Bacteria: other waters. Also, 40 CFR 122.41(e) requires the permittee, at all times, to properly operate and maintain all facilities and systems of treatment in order to comply with the permit. This ensures proper operation of chlorination equipment to maintain adequate disinfection.

C.1. 95% Capacity Reopener
Rationale: Required by VPDES Permit Regulation, 9 VAC 25-31-200 B 2 for all POTW and PVOTW permits.

C.2. CTC, CTO Requirement
Rationale: Required by Code of Virginia §62.1-44.19; Sewage Collection and Treatment Regulations, 9 VAC 25-790.

C.3. O&M Manual Requirement
Rationale: Required by Code of Virginia § 62.1-44.19; Sewage Collection and Treatment Regulations, 9 VAC 25-790; VPDES Permit Regulation, 9 VAC 25-31-190 E.

C.4. Materials Handling/Storage
Rationale: 9 VAC 25-31-50 A. prohibits the discharge of any wastes into State waters unless authorized by permit. Code of Virginia Section §62.1-44.16 and §62.1-44.17 authorizes the Board to regulate the discharge of industrial waste or other waste.

C.5. Licensed Operator Requirement
Rationale: The VPDES Permit Regulation, 9 VAC 25-31-200 C. and the Code of Virginia § 54.1-2300 et seq, Rules and Regulations for Waterworks and Wastewater Works Operators (18 VAC 160-20-10 et seq.), require licensure of operators. Since the facility does not discharge, no licensed operator is required until the upgrade is complete.

C.6. Reliability Class
Rationale: Required by Sewage Collection and Treatment Regulations, 9 VAC 25-790 for all municipal facilities. The facility is being required to meet a reliability class II. Upon upgrade, the facility is required to meet a reliability class I.

C.7. Sludge Reopener
Rationale: Required by VPDES Permit Regulation, 9 VAC 25-31-220 C.4 for all permits issued to treatment works treating domestic sewage.

C.8. TMDL Reopener

Rationale: Section 303(d) of the Clean Water Act requires that total maximum daily loads (TMDLs) be developed for streams listed as impaired. This special condition is to allow the permit to be reopened if necessary to bring it into compliance with any applicable TMDL approved for the receiving stream. The re-opener recognizes that, according to section 402(o)(1) of the Clean Water Act, limits and/or conditions may be either more or less stringent than those contained in this permit. Specifically, they can be relaxed if they are the result of a TMDL, basin plan, or other wasteload allocation prepared under section 303 of the Act. This reopener is included in all permits.

C.9. Compliance Reporting

Rationale: Authorized by VPDES Permit Regulation, 9 VAC 25-31-190 J 4 and 220 I. This condition is necessary when pollutants are monitored by the permittee and a maximum level of quantification and/or a specific analytical method is required in order to assess compliance with a permit limit or to compare effluent quality with a numeric criterion. The condition also establishes protocols for calculation of reported values.

C.10. Sludge Use and Disposal

Rationale: VPDES Permit Regulation, 9 VAC 25-31-100 P; 220 B 2; and 420 through 720, and 40 CFR Part 503 require all treatment works treating domestic sewage to submit information on sludge use and disposal practices and to meet specified standards for sludge use and disposal.

C.11. Ground Water Monitoring Plan

Rationale: Facilities consisting of lagoons for treatment must perform ground water monitoring to ensure protection of ground water standards. A groundwater monitoring plan was approved December 12, 1995 and revised January 16, 2007. The facility will continue to monitor ground water to ensure that the systems integrity is being maintained and to indicate if activities at the site are resulting in violations of the State Water Control Board's standards. The approved plan is an enforceable part of the permit. Any changes to the plan must be submitted for approval to the Piedmont Regional Office.

Evaluation of groundwater data is included in Attachment 6. Significant differences between up gradient and down gradient wells were observed for some parameters as well as exceedances of the ground water standards. A corrective action plan is being required to address these issues.

Monitoring shall remain on a quarterly basis and results shall be submitted to the DEQ, Piedmont Regional Office, on 10th of the month the following the monitoring quarter. (See Attachment 6 for Ground Water Monitoring Data Evaluation)

C.12. Special Monitoring

Rationale: Required to collect operational data for influent flow and water surface elevation to ensure a "no discharge" status or indicate a potential discharge event.

Part II, Conditions Applicable to All Permits

Rationale: VPDES Permit Regulation, 9 VAC 25-31-190 requires all VPDES permits to contain or specifically cite the conditions listed.

22. **Changes to the Permit:**

Permit Cover Page:	
Item	RATIONALE
Initial paragraph	Updated language to reflect current agency guidance that incorporates the permit application as part of the permit.

Part I.A.							
Outfall No.	**Parameter Changed**	**Monitoring Requirement Changed**		**Effluent Limits Changed**		**Reason for Change**	**Date**
		From	To	From	To		
	BOD_5			0.5 kg/d 0.68 kg/d	450 g/d 680 g/d	Loading limitations converted from units of kg/d to g/d in accordance with GM06-2016.	8/08
	TSS			0.91 kg/d 1.4 kg/d	910 g/d 1400 g/d		
	Ammonia	-	-	4.5 mg/L	5.4 mg/L	Evaluation of ammonia indicated a change from the previously permitted limit to a less stringent limitation based on a revised effluent temperature assumption.	11/08
	E. Coli	-	2/Month	-	126 N/ 100 mL	Bacteria limitation added in accordance with procedures for facilities with a TMDL allocation.	8/08

FROM	**TO**	**RATIONALE**
Footnote (1)	Footnote (1)	Updated language to reflect current agency guidance.
-	Footnote (2)	Added language to reflect current agency guidance.
Footnote(2)	Footnote (3)	Revised language to reflect current agency guidance and clarify TRC requirements.
	Footnote (4)	Added language to reflect current agency guidance.
Part I.A.1.b	Part I.A.2	No Change
Part I.A.1.c	Part I.A.3	No Change
Part I.A.1.d	-	Removed. Incorporated into language in Part I.A.1.
-	Part I.A.4	Added language to reflect current agency guidance.

Special Condition Changes:		
FROM	**TO**	**RATIONALE**
B.1	B.1	**Additional Limitations and Monitoring Requirements:** Revised to reflect agency guidance.
B.2	Removed	**Bacterial Limitations and Monitoring Requirements:** The demonstration study results were superseded by the need to include an e-coli limitation in conformance with the bacteria TMDL permitting requirements.
C.1	C.1	**95% Capacity Reopener**: No Change.
--	C.2	**CTC, CTO Requirement:** New condition. Added to reflect current agency guidance.
C.2	C.3	**Operations and Maintenance Manual Requirement:** Updated language to reflect current agency guidance.
C.8	C.4	**Materials Handling/Storage:** No Change.

C.3	C.5	**Licensed Operator Requirement:** No Change.
C.4	C.6	**Reliability Class:** No Change.
C.6	C.7	**Sludge Reopener:** No Change.
--	C.8	**TMDL Reopener:** New condition. Added to reflect current agency guidance.
C.7	C.9	**Compliance Reporting:** Updated language to reflect current agency guidance on compliance reporting and significant digits.
C.5	C.10	**Sludge Use and Disposal:** Updated language to reflect current agency guidance. Change also reflects transfer of the program from VDH to DEQ.
C.9	-	**Treatment Works Closure Plan:** Removed. Language no longer included in permits per current agency guidance.
C.10 and 11.	C.11	**Ground Water Monitoring Plan**: Updated language to reflect current agency guidance. Risk assessment and corrective action plan required due to results of the ground water monitoring analyses.
C.12	C.12	**Special Monitoring:** Language updated.

23. **Variances/Alternate Limits or Conditions**: None

24. **Regulation of Users (9 VAC 25-31-280 B 9):**
There are no industrial dischargers contributing to the treatment works.

25. **Public Notice Information required by 9 VAC 25-31-280 B**:
All pertinent information is on file and may be inspected, and copied by contacting:

Ms. Jaime Bauer at:
Virginia DEQ Piedmont Regional Office
4949-A Cox Road
Glen Allen, VA 23060
Telephone No. (804) 527-5015
Email Address: jlbauer@deq.virginia.gov

Persons may comment in writing or by email to the DEQ on the proposed permit action, and may request a public hearing, during the comment period. Comments shall include the name, address, and telephone number of the writer and of all persons represented by the commenter/requester, and shall contain a complete, concise statement of the factual basis for comments. Only those comments received within this period will be considered. The DEQ may decide to hold a public hearing, including another comment period, if public response is significant and there are substantial, disputed issues relevant to the permit. Requests for public hearings shall state 1) the reason why a hearing is requested; 2) a brief, informal statement regarding the nature and extent of the interest of the requester or of those represented by the requester, including how and to what extent such interest would be directly and adversely affected by the permit; and 3) specific references, where possible, to terms and conditions of the permit with suggested revisions. Following the comment period, the Board will make a determination regarding the proposed permit action. This determination will become effective, unless the DEQ grants a public hearing. Due notice of any public hearing will be given.
The public may review the draft permit and application at the DEQ Piedmont Regional Office by appointment.

26. **Additional Comments**:

a. **Previous Board Action**: None

b. **Staff Comments:**

- Permittees having exemplary operations that consistently meet permit requirements are considered for reduced monitoring per the VPDES Permit Manual and in accordance with EPA's "Interim Guidance for Performance-Based Reduction of NPDES Permit Monitoring Frequencies" (EPA 833-B-96-001). In order to qualify for reduced monitoring, a facility should not have been issued any Warning Letters, Notice of Violations, or Notices of Unsatisfactory Laboratory Evaluations, or be under any Consent Orders, Consent Decrees, Executive Compliance Agreements, or related enforcement documents during the past three years. There was no consideration given to reduced monitoring frequency since the facility has not had a discharge.
- The application was sent to the Virginia Department of Health as required by the VPDES Permit Manual. The response by VDH indicated that they did not object to the re-issuance of the permit. However, they requested a copy of the draft permit for review and comment, when available. VDH submitted a memo dated 11/20/2008 commenting that the Henrico Regional water treatment plant is approximately 18.9 miles downstream of the discharge point. No other comments were included.
- This facility is not subject to the General VPDES Watershed Permit Regulations for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia because the current flow of the facility is less than 40,000 gallons per day (non-tidal significant discharger), and the facility is not expanding. The facility does not have nutrient allocations because the facility is not considered a significant discharger of nutrients. However, the facility has a nutrient permitted design capacity of 227.8 pounds per year Total Nitrogen and 30.5 pounds per year Total Phosphorus, calculated based on secondary technology concentrations values and the current design capacity of 0.004 MGD.
- The permit expiration in this reissuance is being moved forward to the end of November to avoid conflict reissuance with holiday schedules at DEQ and the facility.
- After the public comment period ended, one change was made to correct a typographical error in the permit. In the 2nd sentence in Part I Condition C.6 regarding reliability class the phrase "to Operate" was added after "Certificate" for clarification.
- In an email received on December 19, 2008, Mr. Mark Smith from EPA Region 3 responded that EPA had no objection to the issuance of the permit.

c. **Public Comment:** No comment received.

27. **303(d) Listed Segments (TMDL)**:
The facility discharges directly to an UT of Branch Creek that was not assessed during the 2006 or draft 2008 305(b)/303(d) Water Quality Assessments. However, the facility received an E. coli wasteload allocation of 6.96E+9 cfu/yr in the James River and Tributaries – Lower Piedmont Region TMDL report. The wasteload allocation is based on the facility's permitted flow of 0.004 MGD and an E. coli count of 126 N/100 mL. The permit includes an effluent E. coli limitation of 126 N/mL in order to meet the TMDL wasteload allocation.

28. **Summary of Attachments:**
    1. Flow Frequency Memorandum
    2. Facility Diagram
    3. Topographic Map
    4. Permit Limit Development
    5. Site Visit Memorandum
    6. Ground Water Monitoring Evaluation
    7. Stream Sanitation Analysis – July 15, 1977

Attachment 1 – Flow Frequency Memorandum

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY
Piedmont Regional Office
4949-A Cox Road Glen Allen, Virginia 23060

SUBJECT: Flow Frequency Determination / 303(d) Status
Blessed Sacrament – Huguenot Academy (VA0063037)

TO: Jaime Bauer

FROM: Jennifer V. Palmore, P.G. JVP

DATE: August 12, 2008

COPIES: File

The Blessed Sacrament – Huguenot Academy's sewage treatment plant discharges to an unnamed tributary of Branch Creek in Powhatan County, VA. The discharge is located at river mile 2-XJG000.19. Stream flow frequencies are required at this site for use by the permit writer in developing effluent limitations for the VPDES permit.

At the discharge point, the receiving stream is shown to be a dry ditch which drains to an intermittent stream, as shown on the USGS Powhatan Quadrangle topographic map. The flow frequencies for intermittent streams are shown below.

Unnamed tributary at discharge point:

1Q30 = 0.0 cfs	High Flow 1Q10 = 0.0 cfs
1Q10 = 0.0 cfs	High Flow 7Q10 = 0.0 cfs
7Q10 = 0.0 cfs	High Flow 30Q10 = 0.0 cfs
30Q10 = 0.0 cfs	HM = 0.0 cfs
30Q5 = 0.0 cfs	

Please note that the intermittent stream has been dammed as shown on the attached aerial photograph.

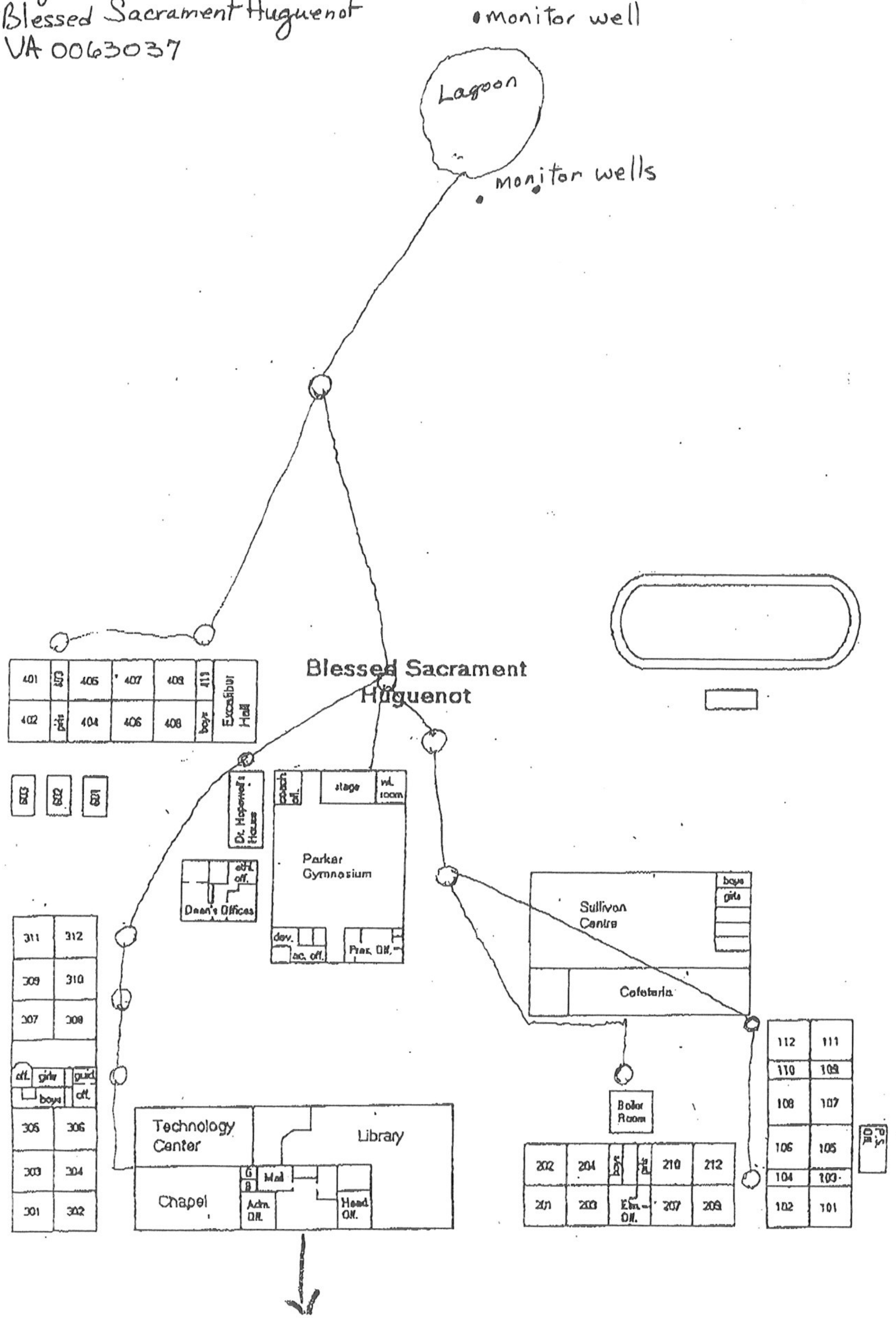
The receiving stream was not assessed during the 2006 or draft 2008 305(b)/303(d) Water Quality Assessment cycles, therefore the waters are considered Category 3A. However, although the stream is not considered impaired for the Recreation Use, the facility received a wasteload allocation in the TMDL report for the James River and Tributaries – Lower Piedmont Region. The wasteload allocation for Blessed Sacrament – Huguenot is 6.96E+09 E. coli cfu/year, which was based on a design flow of 0.004 MGD.

Due to the intermittent nature of the tributary, it is appropriate to use effluent data, rather than ambient stream data, when calculating permit limits.

If you have any questions concerning this analysis, please let me know.

Attachment 2 - Facility Diagram

Page 3: #6
Blessed Sacrament Huguenot
VA 0063037



Attachment 3 – Topographic Map

(FINE CREEK MILLS)
5459 III SE

* Blessed Sacrament - Huguenot

Attachment 4 – Permit Limitation Development

MSTRANTI DATA SOURCE REPORT

VA0063037 –Blessed Sacrament – Huguenot Acadmey

Stream Information:	
Mean Hardness	Same as effluent as recommended by planning staff. See Flow Frequency Memo dated August 12, 2008 (Attachment 1).
90% Temperature	
90% Maximum pH	
10% Maximum pH	
Tier Designation	As advised by planning unit. See Flow Frequency Memo dated August 12, 2008 (Attachment 1).
Stream Flows:	
All Data	As advised by planning unit. See Flow Frequency Memo dated August 12, 2008 (Attachment 1).
Mixing Information:	
Flow Analysis	100% Mix because all flow is from effluent.
Effluent Information:	
Mean Hardness	BPJ. Effluent data not available. Used conservative assumption.
90% Temperature	The facility has not had a discharge, therefore no DMR data available. Based on data from similar operating lagoon systems located in the same geographic region, it is more appropriate to assume a conservative effluent temperature of 28°C.
90% Maximum pH	The facility has not had a discharge, therefore no DMR data available. The maximum and minimum pH reported on the Form 2A Section A.12 2 was used in place of the 90^{th} and 10^{th} percentiles, respectively, since data were limited.
10% Maximum pH	
Discharge Flow	Design Flow as reported in Permit Application Form 2A.

Temperature Data for Permit Development from Facilities with Lagoon Treatment

Permit Num.	Facility Name	Temp Used in Permit Development	Source of Temp
VA0020761	Jarratt STP	28	Permit Application
VA0020877	Northumberland High School	30	Unknown
VA0020885	Callao Shops & Apartments	25	Permit Application
VA0022934	Southside Elementary School	28	Assumption
VA0026891	Town of Warsaw	26.7	Permit Application
VA0027561	Children's Baptist Home	28.1	Permit Application
VA0027910	Manakin Farms	28	Assumption
VA0028291	Nottoway Hotel	28	Assumption
VA0028762	North Elementary School	27.6	Permit Application
VA0062669	Stony Creek	28.8	Permit Application
VA0060569	Windmill Park	29.1	Permit Application
VA000063649	Richmond Country Club WWTP	25	Assumption
VA0088480	Chickahominy WWTP	25	Assumption

FRESHWATER
WATER QUALITY CRITERIA / WASTELOAD ALLOCATION ANALYSIS

Facility Name: Blessed Sacrament - Huguenot Academy   Permit No.: VA0063037

Receiving Stream: UT to Branch Creek   Version: OWP Guidance Memo 00-2011 (8/24/00)

Stream Information		Stream Flows		Mixing Information		Effluent Information	
Mean Hardness (as CaCO3) =	25 mg/L	1Q10 (Annual) =	0 MGD	Annual - 1Q10 Mix =	100 %	Mean Hardness (as CaCO3) =	25 mg/L
90% Temperature (Annual) =	28 deg C	7Q10 (Annual) =	0 MGD	- 7Q10 Mix =	100 %	90% Temp (Annual) =	28 deg C
90% Temperature (Wet season) =	deg C	30Q10 (Annual) =	0 MGD	- 30Q10 Mix =	100 %	90% Temp (Wet season) =	deg C
90% Maximum pH =	6.664 SU	1Q10 (Wet season) =	0 MGD	Wet Season - 1Q10 Mix =	%	90% Maximum pH =	6.67 SU
10% Maximum pH =	6.616 SU	30Q10 (Wet season)	0 MGD	- 30Q10 Mix =	%	10% Maximum pH =	6.61 SU
Tier Designation (1 or 2) =	1	30Q5 =	0 MGD			Discharge Flow =	0.004 MGD
Public Water Supply (PWS) Y/N? =	y	Harmonic Mean =	0 MGD				
Trout Present Y/N? =	n	Annual Average =	0 MGD				
Early Life Stages Present Y/N? =	y						

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Acenapthene	0	--	--	1.2E+03	2.7E+03	--	--	1.2E+03	2.7E+03	--	--	--	--	--	--	--	--	--	--	1.2E+03	2.7E+03
Acrolein	0	--	--	3.2E+02	7.8E+02	--	--	3.2E+02	7.8E+02	--	--	--	--	--	--	--	--	--	--	3.2E+02	7.8E+02
Acrylonitrile[C]	0	--	--	5.9E-01	6.6E+00	--	--	5.9E-01	6.6E+00	--	--	--	--	--	--	--	--	--	--	5.9E-01	6.6E+00
Aldrin [C]	0	3.0E+00	--	1.3E-03	1.4E-03	3.0E+00	--	1.3E-03	1.4E-03	--	--	--	--	--	--	--	--	3.0E+00	--	1.3E-03	1.4E-03
Ammonia-N (mg/l) (Yearly)	0	4.53E+01	2.72E+00	--	--	4.5E+01	2.7E+00	--	--	--	--	--	--	--	--	--	--	4.5E+01	2.7E+00	--	--
Ammonia-N (mg/l) (High Flow)	0	4.53E+01	6.48E+00	--	--	4.5E+01	6.5E+00	--	--	--	--	--	--	--	--	--	--	4.5E+01	6.5E+00	--	--
Anthracene	0	--	--	9.6E+03	1.1E+05	--	--	9.6E+03	1.1E+05	--	--	--	--	--	--	--	--	--	--	9.6E+03	1.1E+05
Antimony	0	--	--	1.4E+01	4.3E+03	--	--	1.4E+01	4.3E+03	--	--	--	--	--	--	--	--	--	--	1.4E+01	4.3E+03
Arsenic	o	3.4E+02	1.5E+02	1.0E+01	--	3.4E+02	1.5E+02	1.0E+01	--	--	--	--	--	--	--	--	--	3.4E+02	1.5E+02	1.0E+01	--
Barium	0	--	--	2.0E+03	--	--	--	2.0E+03	--	--	--	--	--	--	--	--	--	--	--	2.0E+03	--
Benzene [C]	0	--	--	1.2E+01	7.1E+02	--	--	1.2E+01	7.1E+02	--	--	--	--	--	--	--	--	--	--	1.2E+01	7.1E+02
Benzidine[C]	0	--	--	1.2E-03	5.4E-03	--	--	1.2E-03	5.4E-03	--	--	--	--	--	--	--	--	--	--	1.2E-03	5.4E-03
Benzo (a) anthracene [C]	0	--	--	4.4E-02	4.9E-01	--	--	4.4E-02	4.9E-01	--	--	--	--	--	--	--	--	--	--	4.4E-02	4.9E-01
Benzo (b) fluoranthene [C]	0	--	--	4.4E-02	4.9E-01	--	--	4.4E-02	4.9E-01	--	--	--	--	--	--	--	--	--	--	4.4E-02	4.9E-01
Benzo (k) fluoranthene [C]	0	--	--	4.4E-02	4.9E-01	--	--	4.4E-02	4.9E-01	--	--	--	--	--	--	--	--	--	--	4.4E-02	4.9E-01
Benzo (a) pyrene [C]	0	--	--	4.4E-02	4.9E-01	--	--	4.4E-02	4.9E-01	--	--	--	--	--	--	--	--	--	--	4.4E-02	4.9E-01
Bis2-Chloroethyl Ether	0	--	--	3.1E-01	1.4E+01	--	--	3.1E-01	1.4E+01	--	--	--	--	--	--	--	--	--	--	3.1E-01	1.4E+01
Bis2-Chloroisopropyl Ether	0	--	--	1.4E+03	1.7E+05	--	--	1.4E+03	1.7E+05	--	--	--	--	--	--	--	--	--	--	1.4E+03	1.7E+05
Bromoform [C]	0	--	--	4.4E+01	3.6E+03	--	--	4.4E+01	3.6E+03	--	--	--	--	--	--	--	--	--	--	4.4E+01	3.6E+03
Butylbenzylphthalate	0	--	--	3.0E+03	5.2E+03	--	--	3.0E+03	5.2E+03	--	--	--	--	--	--	--	--	--	--	3.0E+03	5.2E+03
Cadmium	0	8.2E-01	3.8E-01	5.0E+00	--	8.2E-01	3.8E-01	5.0E+00	--	--	--	--	--	--	--	--	--	8.2E-01	3.8E-01	5.0E+00	--
Carbon Tetrachloride [C]	0	--	--	2.5E+00	4.4E+01	--	--	2.5E+00	4.4E+01	--	--	--	--	--	--	--	--	--	--	2.5E+00	4.4E+01
Chlordane [C]	0	2.4E+00	4.3E-03	2.1E-02	2.2E-02	2.4E+00	4.3E-03	2.1E-02	2.2E-02	--	--	--	--	--	--	--	--	2.4E+00	4.3E-03	2.1E-02	2.2E-02
Chloride	0	8.6E+05	2.3E+05	2.5E+05	--	8.6E+05	2.3E+05	2.5E+05	--	--	--	--	--	--	--	--	--	8.6E+05	2.3E+05	2.5E+05	--
TRC	0	1.9E+01	1.1E+01	--	--	1.9E+01	1.1E+01	--	--	--	--	--	--	--	--	--	--	1.9E+01	1.1E+01	--	--
Chlorobenzene	0	--	--	6.8E+02	2.1E+04	--	--	6.8E+02	2.1E+04	--	--	--	--	--	--	--	--	--	--	6.8E+02	2.1E+04

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Chlorodibromomethane[C]	0	--	--	4.1E+00	3.4E+02	--	--	4.1E+00	3.4E+02	--	--	--	--	--	--	--	--	--	--	4.1E+00	3.4E+02
Chloroform [C]	0	--	--	3.5E+02	2.9E+04	--	--	3.5E+02	2.9E+04	--	--	--	--	--	--	--	--	--	--	3.5E+02	2.9E+04
2-Chloronaphthalene	0	--	--	1.7E+03	4.3E+03	--	--	1.7E+03	4.3E+03	--	--	--	--	--	--	--	--	--	--	1.7E+03	4.3E+03
2-Chlorophenol	0	--	--	1.2E+02	4.0E+02	--	--	1.2E+02	4.0E+02	--	--	--	--	--	--	--	--	--	--	1.2E+02	4.0E+02
Chlorpyrifos	0	8.3E-02	4.1E-02	--	--	8.3E-02	4.1E-02	--	--	--	--	--	--	--	--	--	--	8.3E-02	4.1E-02	--	--
Chromium III	0	1.8E+02	2.4E+01	--	--	1.8E+02	2.4E+01	--	--	--	--	--	--	--	--	--	--	1.8E+02	2.4E+01	--	--
Chromium VI	0	1.6E+01	1.1E+01	--	--	1.6E+01	1.1E+01	--	--	--	--	--	--	--	--	--	--	1.6E+01	1.1E+01	--	--
Chromium, Total	0	--	--	1.0E+02	--	--	--	1.0E+02	--	--	--	--	--	--	--	--	--	--	--	1.0E+02	--
Chrysene [C]	0	--	--	4.4E-02	4.9E-01	--	--	4.4E-02	4.9E-01	--	--	--	--	--	--	--	--	--	--	4.4E-02	4.9E-01
Copper	0	3.6E+00	2.7E+00	1.3E+03	--	3.6E+00	2.7E+00	1.3E+03	--	--	--	--	--	--	--	--	--	3.6E+00	2.7E+00	1.3E+03	--
Cyanide	0	2.2E+01	5.2E+00	7.0E+02	2.2E+05	2.2E+01	5.2E+00	7.0E+02	2.2E+05	--	--	--	--	--	--	--	--	2.2E+01	5.2E+00	7.0E+02	2.2E+05
DDD [C]	0	--	--	8.3E-03	8.4E-03	--	--	8.3E-03	8.4E-03	--	--	--	--	--	--	--	--	--	--	8.3E-03	8.4E-03
DDE [C]	0	--	--	5.9E-03	5.9E-03	--	--	5.9E-03	5.9E-03	--	--	--	--	--	--	--	--	--	--	5.9E-03	5.9E-03
DDT [C]	0	1.1E+00	1.0E-03	5.9E-03	5.9E-03	1.1E+00	1.0E-03	5.9E-03	5.9E-03	--	--	--	--	--	--	--	--	1.1E+00	1.0E-03	5.9E-03	5.9E-03
Demeton	0	--	1.0E-01	--	--	--	1.0E-01	--	--	--	--	--	--	--	--	--	--	--	1.0E-01	--	--
Dibenz(a,h)anthracene [C]	0	--	--	4.4E-02	4.9E-01	--	--	4.4E-02	4.9E-01	--	--	--	--	--	--	--	--	--	--	4.4E-02	4.9E-01
Dibutyl phthalate	0	--	--	2.7E+03	1.2E+04	--	--	2.7E+03	1.2E+04	--	--	--	--	--	--	--	--	--	--	2.7E+03	1.2E+04
Dichloromethane (Methylene Chloride) [C]	0	--	--	4.7E+01	1.6E+04	--	--	4.7E+01	1.6E+04	--	--	--	--	--	--	--	--	--	--	4.7E+01	1.6E+04
1,2-Dichlorobenzene	0	--	--	2.7E+03	1.7E+04	--	--	2.7E+03	1.7E+04	--	--	--	--	--	--	--	--	--	--	2.7E+03	1.7E+04
1,3-Dichlorobenzene	0	--	--	4.0E+02	2.6E+03	--	--	4.0E+02	2.6E+03	--	--	--	--	--	--	--	--	--	--	4.0E+02	2.6E+03
1,4-Dichlorobenzene	0	--	--	4.0E+02	2.6E+03	--	--	4.0E+02	2.6E+03	--	--	--	--	--	--	--	--	--	--	4.0E+02	2.6E+03
3,3-Dichlorobenzidine[C]	0	--	--	4.0E-01	7.7E-01	--	--	4.0E-01	7.7E-01	--	--	--	--	--	--	--	--	--	--	4.0E-01	7.7E-01
Dichlorobromomethane [C]	0	--	--	5.6E+00	4.6E+02	--	--	5.6E+00	4.6E+02	--	--	--	--	--	--	--	--	--	--	5.6E+00	4.6E+02
1,2-Dichloroethane [C]	0	--	--	3.8E+00	9.9E+02	--	--	3.8E+00	9.9E+02	--	--	--	--	--	--	--	--	--	--	3.8E+00	9.9E+02
1,1-Dichloroethylene	0	--	--	3.1E+02	1.7E+04	--	--	3.1E+02	1.7E+04	--	--	--	--	--	--	--	--	--	--	3.1E+02	1.7E+04
1,2-trans-dichloroethylene	0	--	--	7.0E+02	1.4E+05	--	--	7.0E+02	1.4E+05	--	--	--	--	--	--	--	--	--	--	7.0E+02	1.4E+05
2,4-Dichlorophenol	0	--	--	9.3E+01	7.9E+02	--	--	9.3E+01	7.9E+02	--	--	--	--	--	--	--	--	--	--	9.3E+01	7.9E+02
2,4-Dichlorophenoxy acetic acid (2,4-D)	0	--	--	1.0E+02	--	--	--	1.0E+02	--	--	--	--	--	--	--	--	--	--	--	1.0E+02	--
1,2-Dichloropropane[C]	0	--	--	5.2E+00	3.9E+02	--	--	5.2E+00	3.9E+02	--	--	--	--	--	--	--	--	--	--	5.2E+00	3.9E+02
1,3-Dichloropropene	0	--	--	1.0E+01	1.7E+03	--	--	1.0E+01	1.7E+03	--	--	--	--	--	--	--	--	--	--	1.0E+01	1.7E+03
Dieldrin [C]	0	2.4E-01	5.6E-02	1.4E-03	1.4E-03	2.4E-01	5.6E-02	1.4E-03	1.4E-03	--	--	--	--	--	--	--	--	2.4E-01	5.6E-02	1.4E-03	1.4E-03
Diethyl Phthalate	0	--	--	2.3E+04	1.2E+05	--	--	2.3E+04	1.2E+05	--	--	--	--	--	--	--	--	--	--	2.3E+04	1.2E+05
Di-2-Ethylhexyl Phthalate [C]	0	--	--	1.8E+01	5.9E+01	--	--	1.8E+01	5.9E+01	--	--	--	--	--	--	--	--	--	--	1.8E+01	5.9E+01
2,4-Dimethylphenol	0	--	--	5.4E+02	2.3E+03	--	--	5.4E+02	2.3E+03	--	--	--	--	--	--	--	--	--	--	5.4E+02	2.3E+03
Dimethyl Phthalate	0	--	--	3.1E+05	2.9E+06	--	--	3.1E+05	2.9E+06	--	--	--	--	--	--	--	--	--	--	3.1E+05	2.9E+06
Di-n-Butyl Phthalate	0	--	--	2.7E+03	1.2E+04	--	--	2.7E+03	1.2E+04	--	--	--	--	--	--	--	--	--	--	2.7E+03	1.2E+04
2,4 Dinitrophenol	0	--	--	7.0E+01	1.4E+04	--	--	7.0E+01	1.4E+04	--	--	--	--	--	--	--	--	--	--	7.0E+01	1.4E+04
2-Methyl-4,6-Dinitrophenol	0	--	--	1.3E+01	7.65E+02	--	--	1.3E+01	7.7E+02	--	--	--	--	--	--	--	--	--	--	1.3E+01	7.7E+02
2,4-Dinitrotoluene [C]	0	--	--	1.1E+00	9.1E+01	--	--	1.1E+00	9.1E+01	--	--	--	--	--	--	--	--	--	--	1.1E+00	9.1E+01
Dioxin (2,3,7,8-tetrachlorodibenzo-p-dioxin) (ppq)	0	--	--	1.2E-06	1.2E-06	--	--	1.2E-06	1.2E-06	--	--	--	--	--	--	--	--	--	--	1.2E-06	1.2E-06
1,2-Diphenylhydrazine[C]	0	--	--	4.0E-01	5.4E+00	--	--	4.0E-01	5.4E+00	--	--	--	--	--	--	--	--	--	--	4.0E-01	5.4E+00
Alpha-Endosulfan	0	2.2E-01	5.6E-02	1.1E+02	2.4E+02	2.2E-01	5.6E-02	1.1E+02	2.4E+02	--	--	--	--	--	--	--	--	2.2E-01	5.6E-02	1.1E+02	2.4E+02
Beta-Endosulfan	0	2.2E-01	5.6E-02	1.1E+02	2.4E+02	2.2E-01	5.6E-02	1.1E+02	2.4E+02	--	--	--	--	--	--	--	--	2.2E-01	5.6E-02	1.1E+02	2.4E+02
Endosulfan Sulfate	0	--	--	1.1E+02	2.4E+02	--	--	1.1E+02	2.4E+02	--	--	--	--	--	--	--	--	--	--	1.1E+02	2.4E+02
Endrin	0	8.6E-02	3.6E-02	7.6E-01	8.1E-01	8.6E-02	3.6E-02	7.6E-01	8.1E-01	--	--	--	--	--	--	--	--	8.6E-02	3.6E-02	7.6E-01	8.1E-01
Endrin Aldehyde	0	--	--	7.6E-01	8.1E-01	--	--	7.6E-01	8.1E-01	--	--	--	--	--	--	--	--	--	--	7.6E-01	8.1E-01

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
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Ethylbenzene	0	--	--	3.1E+03	2.9E+04	--	--	3.1E+03	2.9E+04	--	--	--	--	--	--	--	--	--	--	3.1E+03	2.9E+04
Fluoranthene	0	--	--	3.0E+02	3.7E+02	--	--	3.0E+02	3.7E+02	--	--	--	--	--	--	--	--	--	--	3.0E+02	3.7E+02
Fluorene	0	--	--	1.3E+03	1.4E+04	--	--	1.3E+03	1.4E+04	--	--	--	--	--	--	--	--	--	--	1.3E+03	1.4E+04
Foaming Agents	0	--	--	5.0E+02	--	--	--	5.0E+02	--	--	--	--	--	--	--	--	--	--	--	5.0E+02	--
Guthion	0	--	1.0E-02	--	--	--	1.0E-02	--	--	--	--	--	--	--	--	--	--	--	1.0E-02	--	--
Heptachlor ^{C}	0	5.2E-01	3.8E-03	2.1E-03	2.1E-03	5.2E-01	3.8E-03	2.1E-03	2.1E-03	--	--	--	--	--	--	--	--	5.2E-01	3.8E-03	2.1E-03	2.1E-03
Heptachlor Epoxide^C	0	5.2E-01	3.8E-03	1.0E-03	1.1E-03	5.2E-01	3.8E-03	1.0E-03	1.1E-03	--	--	--	--	--	--	--	--	5.2E-01	3.8E-03	1.0E-03	1.1E-03
Hexachlorobenzene^C	0	--	--	7.5E-03	7.7E-03	--	--	7.5E-03	7.7E-03	--	--	--	--	--	--	--	--	--	--	7.5E-03	7.7E-03
Hexachlorobutadiene^C	0	--	--	4.4E+00	5.0E+02	--	--	4.4E+00	5.0E+02	--	--	--	--	--	--	--	--	--	--	4.4E+00	5.0E+02
Hexachlorocyclohexane Alpha-BHC^C	0	--	--	3.9E-02	1.3E-01	--	--	3.9E-02	1.3E-01	--	--	--	--	--	--	--	--	--	--	3.9E-02	1.3E-01
Hexachlorocyclohexane Beta-BHC^C	0	--	--	1.4E-01	4.6E-01	--	--	1.4E-01	4.6E-01	--	--	--	--	--	--	--	--	--	--	1.4E-01	4.6E-01
Hexachlorocyclohexane Gamma-BHC^C (Lindane)	0	9.5E-01	--	1.9E-01	6.3E-01	9.5E-01	--	1.9E-01	6.3E-01	--	--	--	--	--	--	--	--	9.5E-01	--	1.9E-01	6.3E-01
Hexachlorocyclopentadiene	0	--	--	2.4E+02	1.7E+04	--	--	2.4E+02	1.7E+04	--	--	--	--	--	--	--	--	--	--	2.4E+02	1.7E+04
Hexachloroethane^C	0	--	--	1.9E+01	8.9E+01	--	--	1.9E+01	8.9E+01	--	--	--	--	--	--	--	--	--	--	1.9E+01	8.9E+01
Hydrogen Sulfide	0	--	2.0E+00	--	--	--	2.0E+00	--	--	--	--	--	--	--	--	--	--	--	2.0E+00	--	--
Indeno (1,2,3-cd) pyrene ^{C}	0	--	--	4.4E-02	4.9E-01	--	--	4.4E-02	4.9E-01	--	--	--	--	--	--	--	--	--	--	4.4E-02	4.9E-01
Iron	0	--	--	3.0E+02	--	--	--	3.0E+02	--	--	--	--	--	--	--	--	--	--	--	3.0E+02	--
Isophorone^C	0	--	--	3.6E+02	2.6E+04	--	--	3.6E+02	2.6E+04	--	--	--	--	--	--	--	--	--	--	3.6E+02	2.6E+04
Kepone	0	--	0.0E+00	--	--	--	0.0E+00	--	--	--	--	--	--	--	--	--	--	--	0.0E+00	--	--
Lead	0	2.0E+01	2.3E+00	1.5E+01	--	2.0E+01	2.3E+00	1.5E+01	--	--	--	--	--	--	--	--	--	2.0E+01	2.3E+00	1.5E+01	--
Malathion	0	--	1.0E-01	--	--	--	1.0E-01	--	--	--	--	--	--	--	--	--	--	--	1.0E-01	--	--
Manganese	0	--	--	5.0E+01	--	--	--	5.0E+01	--	--	--	--	--	--	--	--	--	--	--	5.0E+01	--
Mercury	0	1.4E+00	7.7E-01	5.0E-02	5.1E-02	1.4E+00	7.7E-01	5.0E-02	5.1E-02	--	--	--	--	--	--	--	--	1.4E+00	7.7E-01	5.0E-02	5.1E-02
Methyl Bromide	0	--	--	4.8E+01	4.0E+03	--	--	4.8E+01	4.0E+03	--	--	--	--	--	--	--	--	--	--	4.8E+01	4.0E+03
Methoxychlor	0	--	3.0E-02	1.0E+02	--	--	3.0E-02	1.0E+02	--	--	--	--	--	--	--	--	--	--	3.0E-02	1.0E+02	--
Mirex	0	--	0.0E+00	--	--	--	0.0E+00	--	--	--	--	--	--	--	--	--	--	--	0.0E+00	--	--
Monochlorobenzene	0	--	--	6.8E+02	2.1E+04	--	--	6.8E+02	2.1E+04	--	--	--	--	--	--	--	--	--	--	6.8E+02	2.1E+04
Nickel	0	5.6E+01	6.3E+00	6.1E+02	4.6E+03	5.6E+01	6.3E+00	6.1E+02	4.6E+03	--	--	--	--	--	--	--	--	5.6E+01	6.3E+00	6.1E+02	4.6E+03
Nitrate (as N)	0	--	--	1.0E+04	--	--	--	1.0E+04	--	--	--	--	--	--	--	--	--	--	--	1.0E+04	--
Nitrobenzene	0	--	--	1.7E+01	1.9E+03	--	--	1.7E+01	1.9E+03	--	--	--	--	--	--	--	--	--	--	1.7E+01	1.9E+03
N-Nitrosodimethylamine^C	0	--	--	6.9E-03	8.1E+01	--	--	6.9E-03	8.1E+01	--	--	--	--	--	--	--	--	--	--	6.9E-03	8.1E+01
N-Nitrosodiphenylamine^C	0	--	--	5.0E+01	1.6E+02	--	--	5.0E+01	1.6E+02	--	--	--	--	--	--	--	--	--	--	5.0E+01	1.6E+02
N-Nitrosodi-n-propylamine^C	0	--	--	5.0E-02	1.4E+01	--	--	5.0E-02	1.4E+01	--	--	--	--	--	--	--	--	--	--	5.0E-02	1.4E+01
Parathion	0	6.5E-02	1.3E-02	--	--	6.5E-02	1.3E-02	--	--	--	--	--	--	--	--	--	--	6.5E-02	1.3E-02	--	--
PCB-1016	0	--	1.4E-02	--	--	--	1.4E-02	--	--	--	--	--	--	--	--	--	--	--	1.4E-02	--	--
PCB-1221	0	--	1.4E-02	--	--	--	1.4E-02	--	--	--	--	--	--	--	--	--	--	--	1.4E-02	--	--
PCB-1232	0	--	1.4E-02	--	--	--	1.4E-02	--	--	--	--	--	--	--	--	--	--	--	1.4E-02	--	--
PCB-1242	0	--	1.4E-02	--	--	--	1.4E-02	--	--	--	--	--	--	--	--	--	--	--	1.4E-02	--	--
PCB-1248	0	--	1.4E-02	--	--	--	1.4E-02	--	--	--	--	--	--	--	--	--	--	--	1.4E-02	--	--
PCB-1254	0	--	1.4E-02	--	--	--	1.4E-02	--	--	--	--	--	--	--	--	--	--	--	1.4E-02	--	--
PCB-1260	0	--	1.4E-02	--	--	--	1.4E-02	--	--	--	--	--	--	--	--	--	--	--	1.4E-02	--	--
PCB Total^C	0	--	--	1.7E-03	1.7E-03	--	--	1.7E-03	1.7E-03	--	--	--	--	--	--	--	--	--	--	1.7E-03	1.7E-03

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Pentachlorophenol [C]	0	5.9E+00	4.5E+00	2.8E+00	8.2E+01	5.9E+00	4.5E+00	2.8E+00	8.2E+01	--	--	--	--	--	--	--	--	**5.9E+00**	**4.5E+00**	**2.8E+00**	**8.2E+01**
Phenol	0	--	--	2.1E+04	4.6E+06	--	--	2.1E+04	4.6E+06	--	--	--	--	--	--	--	--	--	--	**2.1E+04**	**4.6E+06**
Pyrene	0	--	--	9.6E+02	1.1E+04	--	--	9.6E+02	1.1E+04	--	--	--	--	--	--	--	--	--	--	**9.6E+02**	**1.1E+04**
Radionuclides (pCi/l except Beta/Photon)	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gross Alpha Activity	0	--	--	1.5E+01	1.5E+01	--	--	1.5E+01	1.5E+01	--	--	--	--	--	--	--	--	--	--	**1.5E+01**	**1.5E+01**
Beta and Photon Activity (mrem/yr)	0	--	--	4.0E+00	4.0E+00	--	--	4.0E+00	4.0E+00	--	--	--	--	--	--	--	--	--	--	**4.0E+00**	**4.0E+00**
Strontium-90	0	--	--	8.0E+00	8.0E+00	--	--	8.0E+00	8.0E+00	--	--	--	--	--	--	--	--	--	--	**8.0E+00**	**8.0E+00**
Tritium	0	--	--	2.0E+04	2.0E+04	--	--	2.0E+04	2.0E+04	--	--	--	--	--	--	--	--	--	--	**2.0E+04**	**2.0E+04**
Selenium	0	2.0E+01	5.0E+00	1.7E+02	1.1E+04	2.0E+01	5.0E+00	1.7E+02	1.1E+04	--	--	--	--	--	--	--	--	**2.0E+01**	**5.0E+00**	**1.7E+02**	**1.1E+04**
Silver	0	3.2E-01	--	--	--	3.2E-01	--	--	--	--	--	--	--	--	--	--	--	**3.2E-01**	--	--	--
Sulfate	0	--	--	2.5E+05	--	--	--	2.5E+05	--	--	--	--	--	--	--	--	--	--	--	**2.5E+05**	--
1,1,2,2-Tetrachloroethane [C]	0	--	--	1.7E+00	1.1E+02	--	--	1.7E+00	1.1E+02	--	--	--	--	--	--	--	--	--	--	**1.7E+00**	**1.1E+02**
Tetrachloroethylene [C]	0	--	--	8.0E+00	8.9E+01	--	--	8.0E+00	8.9E+01	--	--	--	--	--	--	--	--	--	--	**8.0E+00**	**8.9E+01**
Thallium	0	--	--	1.7E+00	6.3E+00	--	--	1.7E+00	6.3E+00	--	--	--	--	--	--	--	--	--	--	**1.7E+00**	**6.3E+00**
Toluene	0	--	--	6.8E+03	2.0E+05	--	--	6.8E+03	2.0E+05	--	--	--	--	--	--	--	--	--	--	**6.8E+03**	**2.0E+05**
Total dissolved solids	0	--	--	5.0E+05	--	--	--	5.0E+05	--	--	--	--	--	--	--	--	--	--	--	**5.0E+05**	--
Toxaphene [C]	0	7.3E-01	2.0E-04	7.3E-03	7.5E-03	7.3E-01	2.0E-04	7.3E-03	7.5E-03	--	--	--	--	--	--	--	--	**7.3E-01**	**2.0E-04**	**7.3E-03**	**7.5E-03**
Tributyltin	0	4.6E-01	6.3E-02	--	--	4.6E-01	6.3E-02	--	--	--	--	--	--	--	--	--	--	**4.6E-01**	**6.3E-02**	--	--
1,2,4-Trichlorobenzene	0	--	--	2.6E+02	9.4E+02	--	--	2.6E+02	9.4E+02	--	--	--	--	--	--	--	--	--	--	**2.6E+02**	**9.4E+02**
1,1,2-Trichloroethane [C]	0	--	--	6.0E+00	4.2E+02	--	--	6.0E+00	4.2E+02	--	--	--	--	--	--	--	--	--	--	**6.0E+00**	**4.2E+02**
Trichloroethylene [C]	0	--	--	2.7E+01	8.1E+02	--	--	2.7E+01	8.1E+02	--	--	--	--	--	--	--	--	--	--	**2.7E+01**	**8.1E+02**
2,4,6-Trichlorophenol [C]	0	--	--	2.1E+01	6.5E+01	--	--	2.1E+01	6.5E+01	--	--	--	--	--	--	--	--	--	--	**2.1E+01**	**6.5E+01**
2-(2,4,5-Trichlorophenoxy) propionic acid (Silvex)	0	--	--	5.0E+01	--	--	--	5.0E+01	--	--	--	--	--	--	--	--	--	--	--	**5.0E+01**	--
Vinyl Chloride [C]	0	--	--	2.3E-01	6.1E+01	--	--	2.3E-01	6.1E+01	--	--	--	--	--	--	--	--	--	--	**2.3E-01**	**6.1E+01**
Zinc	0	3.6E+01	3.6E+01	9.1E+03	6.9E+04	3.6E+01	3.6E+01	9.1E+03	6.9E+04	--	--	--	--	--	--	--	--	**3.6E+01**	**3.6E+01**	**9.1E+03**	**6.9E+04**

Notes:

1. All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise
2. Discharge flow is highest monthly average or Form 2C maximum for Industries and design flow for Municipals
3. Metals measured as Dissolved, unless specified otherwise
4. "C" indicates a carcinogenic parameter
5. Regular WLAs are mass balances (minus background concentration) using the % of stream flow entered above under Mixing Information. Antidegradation WLAs are based upon a complete mix.
6. Antideg. Baseline = (0.25(WQC - background conc.) + background conc.) for acute and chronic
   = (0.1(WQC - background conc.) + background conc.) for human health
7. WLAs established at the following stream flows: 1Q10 for Acute, 30Q10 for Chronic Ammonia, 7Q10 for Other Chronic, 30Q5 for Non-carcinogens, Harmonic Mean for Carcinogens, and Annual Average for Dioxin. Mixing ratios may be substituted for stream flows where appropriate.

Metal	Target Value (SSTV)
Antimony	1.4E+01
Arsenic	1.0E+01
Barium	2.0E+03
Cadmium	2.3E-01
Chromium III	1.4E+01
Chromium VI	6.4E+00
Copper	1.5E+00
Iron	3.0E+02
Lead	1.4E+00
Manganese	5.0E+01
Mercury	5.0E-02
Nickel	3.8E+00
Selenium	3.0E+00
Silver	1.3E-01
Zinc	1.4E+01

Note: do not use QL's lower than the minimum QL's provided in agency guidance

Facility = VA0063037 - Blessed Sacrament
Chemical = Ammonia
Chronic averaging period = 30
WLAa = 45
WLAc = 2.7
Q.L. = 0.2
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 1
Expected Value = 9
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average= 10.8544
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity
Maximum Daily Limit = 5.44770925222404
Average Weekly Limit = 5.44770925222404
Average Monthly Limit = 5.44770925222404

The data are:

9

Facility = VA0063037 - Blessed Sacrament
Chemical = TRC
Chronic averaging period = 4
WLAa = 0.019
WLAc = 0.011
Q.L. = 0.1
# samples/mo. = 30
# samples/wk. = 7

Summary of Statistics:

observations = 1
Expected Value = 20
Variance = 144
C.V. = 0.6
97th percentile daily values = 48.6683
97th percentile 4 day average = 33.2758
97th percentile 30 day average= 24.1210
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity
Maximum Daily Limit = 1.60883226245855E-02
Average Weekly Limit = 9.8252545713861E-03
Average Monthly Limit = 7.9737131838758E-03

The data are:

20

Attachment 5 – Site Visit Memorandum

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY
Piedmont Regional Office

4949-A Cox Road, Glen Allen, Virginia 23060-6295 804/527-5020

TO: File
FROM: Jaime Bauer, Water Permit Writer
DATE: December 17, 2008
SUBJECT: Site Visit VA0063037 – Huguenot Academy – Blessed Sacrament
Cc: Charlie Stitzer, Water Compliance Inspector

On Tuesday December 17, 2008, I met with Huguenot Academy President, Mr. James Fortune to perform a site visit at the Blessed Sacrament school located in Powhatan County. The VPDES permit for this facility will expire on December 25, 2008. The facility maintains a waste stabilization lagoon which receives wastewater by gravity flow. There are approximately 500 students and staff at the school. The grass around the lagoon is well maintained. The temporary gate was installed on the fence around the lagoon because the previous gate was stolen. The lagoon did not appear to be discharging which is consistent with monthly DMRs.

There was no sampling performed or review of onsite records.

Attachment 6 – Ground Water Monitoring Evaluation

Groundwater Monitoring Data Analysis

Background

A ground water monitoring plan for the Blessed Sacrament - Huguenot Academy was approved December 12, 1995. The plan included the installation of MW-1, MW-2 and MW-3. Review of the ground water monitoring data in 2003 indicated potential ground water contamination from stabilization lagoon. The 2003 permit required the facility to submit a corrective action plan for possible ground water contamination. The CAP proposed installing additional monitoring wells, conducting a pump test on MW-2, and investigating areas around the outfall for lagoon failure. The CAP was approved by the Department on September 29, 2004. MW-2 was closed in November 2004 and MW-4 was installed. Additional monitoring wells (MW-5, MW-6, and MW-7) were proposed and subsequently installed in response to high *E. coli* concentrations in MW-4 reported in the ground water monitoring results received December 20, 2006.A revision to the plan was approved on January 16, 2007 to change the bacteria testing from fecal coliform to *E. coli.*

The ground water monitoring currently occurs at six wells (MW-1, MW-3, MW-4, MW-5, MW-6, and MW-7) for the following parameters: *E. coli* (formerly fecal coliform was monitored), chlorides, ammonia, nitrate, total organic carbon (TOC), and total phosphorus. Normality of data sets reported from 2001 through 2008 were tested using the Kolmorogov-Smirnov Goodness of Fit Test for Continuous Data (at a 5% Level of Significance)." The Student's T-test was used to determine whether or not there was a significant difference between the identified up-gradient and down gradient wells for each parameter where the data was normally distributed. For those parameters where the data was not normally distributed, a non-parametric test was used to determine if the non-normal data demonstrated a significant difference in up-gradient and down gradient data. The normal (t-test) and non-normal test results are below. Well MW-1 is the background monitoring well. The data were also reviewed for exceedances of the Ground Water Standards for the Piedmont and Blue Ridge Providence found in 9 VAC 25-280-50.

Data Evaluation

Summary of Significance Tests

	MW3	MW4	MW5	MW6	MW7
***E. coli* (fecal coliform previously monitored)**		X			
pH					
Chlorides	X		X		X
Ammonia		X			
Nitrate					
TOC		X			
Total Phosphorus					

"X" signifies a significant difference between the up gradient and down gradient well was observed.

Results

***E. coli* (previously monitored as fecal coliform):** The analysis indicates that there is significant increase above background at MW-4. There is no ground water standard for *E. coli* or fecal coliform.

pH: The analysis indicates that there is no significant increase over background at any of the monitoring wells. However, on several occasions the ground water monitoring results were found to exceed the ground water standard range of 5.5-8.5 S.U. Specifically, results were found outside the standard range as follows: MW-1: 12 times, MW-3: 5 times, MW-4: 4 times, MW-5: 3 times, and MW-7: 2 times.

Chlorides: The analysis indicates that there is significant increase over background concentrations at MW-3, MW-5, and MW-7. There is no groundwater standard for chlorides but there is a Water Quality Criterion of 25 mg/l in the Piedmont Physiographic province. Two data points at MW-5 exceeded this criterion and three other recorded data points closely approached it with recorded measurements of 24.9, 24.2, and 24.6.

Ammonia: The analysis indicates that there is significant increase over background at MW-4. In addition, the ground water standard for ammonia is 0.025 mg/L. The detection limit for ammonia was reported as 1.0 mg/L. For results reported as "below detection level" compliance with the ground water standard for ammonia could not be evaluated. However, monitoring demonstrated exceedance of the standards on several occasions as follows: MW-1: 9 times, MW-3: 7 times, MW-4 3 times, MW-5: 6 times, MW-6: 1 time, and MW-7: 1 time.

Nitrate: The analysis indicates that there is no significant increase over background at any of the monitoring wells. The data demonstrates that the ground water standard of 5.0 mg/L for nitrate was occasionally exceeded as follows: MW-1: 1 time, MW-3: 5 times, and MW-4: 2 times.

TOC: The analysis indicates that there is significant increase over background at MW-4.

Total Phosphorus: The analysis indicates that there is no significant increase over background at any of the monitoring wells.

Conclusion

In a few incidences, fecal coliform and *E. coli* measurements were reported higher than <1 n/100 mL. It is abnormal for ground water to contain either of these parameters in concentrations greater than <1 n/100 mL. The permittee has indicated that the flush surface mount on MW-1 has begun to fail and that MW-4 has structural damage. *E. coli* and fecal coliform observations were inconsistently high, and the consultant for the permittee believes this to be from surface runoff infiltration during storm events. The consultant is proposing to replace MW-4 because of the extensive problems. The permittee has been instructed to make the necessary repairs and replacement to both of these monitoring wells to rectify the problems.

Significant differences in up gradient and down gradient wells for ammonia and TOC were also observed. A significant difference in wells MW-3, MW-5, and MW-7 from the background well for chloride was observed. However, as previously noted there is no standard for chloride and only MW-5 exceeded the Water Quality Criterion of 25 mg/L on two occasions.

As previously noted, on several instances results from the ground water monitoring exceeded the ground water monitoring standards for the Piedmont and Blue Ridge Providence found in 9 VAC 20-280-50. A corrective action plan is being required as part of the permit to address the ground water standard exceedances and the significant differences noted above.

Fecal and Ecoli Data - MPN

Ecoli Sampling began in November 2006

	WELL 1	WELL 3	WELL 4	WELL 5	WELL 6	WELL 7
Jan-01	<2	<2				
Mar-01	<2	<2				
Jun-01	<2	50				
Oct-01	<2	<2				
Dec-01	<2	<2				
Jun-02	<2	NDR				
Mar-03	<2	<2				
Jun-03	<2	2				
Aug-03	<2	4				
Nov-03	<2	<2				
Mar-04	<2	<2				
Jun-04	50	<2				
Nov-04	<2	<2	2			
Jan-05	<2	<2	<2			
Jun-05	<2	<2	<2			
Sep-05	<1	<1	NDR			
Dec-05	<2	<2	NDR			
Mar-06	<1	<1	<1			
May-06	<1	<1	NDR			
Sep-06	<1	<1	NDR			
Nov-06	1	4	5790			
Feb-07	1	<1	<1	1	<1	<1
Jun-07	1	<1	1	1	<1	<1
Sep-07	1730	<1	NDR	1	1	<1
Dec-07	5	NDR	NDR	<1	NDR	<1
Mar-08	<1	<1	NDR	<1	<1	<1
Jun-08	13	<1	1200	<1	1	156

NDR: No Data Reported

0: Below Quantification Level

Groundwater Data Analysis for Non-normal Data

Parameter	Fecal/Ecoli
Up Gradient Data	**Down Gradient Data**
2	2
2	2
2	50
2	2
2	2
2	
2	2
2	2
2	4
2	2
2	2
50	2
2	2
2	2
2	2
1	1
2	2
1	1
1	1
1	1
1	4
1	1
1	1
1730	1
5	
1	1
13	1
Minimum 1	**Minimum** 1
Maximum 1730	**Maximum** 50
Is there a significant difference?	
NO	

Permit Number	VA0063037
Facility Name	Huguenot Academy
Parameter	Fecal/Ecoli
Monitoring Well #:	MW3

Groundwater Data Analysis for Non-normal Data

Parameter	Fecal/Ecoli
Up Gradient Data	**Down Gradient Data**
2	2
2	2
2	2
2	1
2	5790
2	1
2	1
2	1200
2	
2	
2	
50	
2	
2	
2	
1	
2	
1	
1	
1	
1	
1	
1	
1730	
5	
1	
13	
Minimum 1	**Minimum** 1
Maximum 1730	**Maximum** 5790
Is there a significant difference?	
YES	

Permit Number	VA0063037
Facility Name	Huguenot Academy
Parameter	Fecal/Ecoli
Monitoring Well #:	MW4

Cochran's Approximation to the Behrens-Fisher Student's t-Test (at a 5% Level of Significance)

Permit Number	VA0063037
Facility Name	Huguenot Academy
Parameter	Fecal/Ecoli
Monitoring Well #:	MW5
What is the number of observations in the set of background data (n_b)?	27
What is the number of observations in the set of monitoring data (n_m)?	6

	Background	Monitored Site	$[X_b\text{-}X_b(ave)]^2$	$[X_m\text{-}X_m(ave)]^2$
1	2	1	4356.000	0.000
2	2	1	4356.000	0.000
3	2	1	4356.000	0.000
4	2	1	4356.000	0.000
5	2	1	4356.000	0.000
6	2	1	4356.000	0.000
7	2	0	4356.000	0.000
8	2	0	4356.000	0.000
9	2	0	4356.000	0.000
10	2	0	4356.000	0.000
11	2	0	4356.000	0.000
12	50	0	324.000	0.000
13	2	0	4356.000	0.000
14	2	0	4356.000	0.000
15	2	0	4356.000	0.000
16	1	0	4489.000	0.000
17	2	0	4356.000	0.000
18	1	0	4489.000	0.000
19	1	0	4489.000	0.000
20	1	0	4489.000	0.000
21	1	0	4489.000	0.000
22	1	0	4489.000	0.000
23	1	0	4489.000	0.000
24	1730	0	2762244.000	0.000
25	5	0	3969.000	0.000
26	1	0	4489.000	0.000
27	13	0	3025.000	0.000
28	0	0	0.000	0.000
29	0	0	0.000	0.000
30	0	0	0.000	0.000
31	0	0	0.000	0.000
32	0	0	0.000	0.000
33	0	0	0.000	0.000
34	0	0	0.000	0.000
35	0	0	0.000	0.000
36	0	0	0.000	0.000
37	0	0	0.000	0.000
38	0	0	0.000	0.000
39	0	0	0.000	0.000
40	0	0	0.000	0.000

$X_b(ave) =$ 68.000 $X_m(ave) =$ 1.000

$T_b =$ 1.706 (from lookup table)
$T_m =$ 2.015

$s_b^2 =$ 110415.923 $= [(X_{b1}\text{-}X_b(ave))^2+(X_{b2}\text{-}X_b(ave))^2...(X_{bn}\text{-}X_b(ave))^2]/(n_b\text{-}1)$
$s_m^2 =$ 0.000 $= [(X_{m1}\text{-}X_m(ave))^2+(X_{m2}\text{-}X_m(ave))^2..(X_{mn}\text{-}X_m(ave))^2]/(n_m\text{-}1)$

$T_{star} =$ **-1.048** $= [X_m(ave)\text{-}X_b(ave)]/\text{sqrt}(s_m^2/n_m + s_b^2/n_b)$

$W_b =$ 4089.479 $= s_b^2/n_b$
$W_m =$ 0.000 $= s_m^2/n_m$

$T_{comp} =$ **1.706** $= (W_b*T_b + W_m*T_m)/(W_b + W_m)$

There is no significant difference between the monitoring data and the background data or there is a failure of the assumption made for test validity

Cochran's Approximation to the Behrens-Fisher Student's t-Test (at a 5% Level of Significance)

Permit Number	VA0063037
Facility Name	Huguenot Academy
Parameter	Fecal/Ecoli
Monitoring Well #:	MW6
What is the number of observations in the set of background data (n_b)?	27
What is the number of observations in the set of monitoring data (n_m)?	5

	Background	Monitored Site	$[X_b-X_b(ave)]^2$	$[X_m-X_m(ave)]^2$
1	2	1	4356.000	0.000
2	2	1	4356.000	0.000
3	2	1	4356.000	0.000
4	2	1	4356.000	0.000
5	2	1	4356.000	0.000
6	2	0	4356.000	0.000
7	2	0	4356.000	0.000
8	2	0	4356.000	0.000
9	2	0	4356.000	0.000
10	2	0	4356.000	0.000
11	2	0	4356.000	0.000
12	50	0	324.000	0.000
13	2	0	4356.000	0.000
14	2	0	4356.000	0.000
15	2	0	4356.000	0.000
16	1	0	4489.000	0.000
17	2	0	4356.000	0.000
18	1	0	4489.000	0.000
19	1	0	4489.000	0.000
20	1	0	4489.000	0.000
21	1	0	4489.000	0.000
22	1	0	4489.000	0.000
23	1	0	4489.000	0.000
24	1730	0	2762244.000	0.000
25	5	0	3969.000	0.000
26	1	0	4489.000	0.000
27	13	0	3025.000	0.000
28	0	0	0.000	0.000
29	0	0	0.000	0.000
30	0	0	0.000	0.000
31	0	0	0.000	0.000
32	0	0	0.000	0.000
33	0	0	0.000	0.000
34	0	0	0.000	0.000
35	0	0	0.000	0.000
36	0	0	0.000	0.000
37	0	0	0.000	0.000
38	0	0	0.000	0.000
39	0	0	0.000	0.000
40	0	0	0.000	0.000

$X_b(ave)$ = 68.000 $X_m(ave)$ = 1.000

T_b = 1.706 (from lookup table)
T_m = 2.132

s_b^2 = 110415.923 $= [(X_{b1}-X_b(ave))^2+(X_{b2}-X_b(ave))^2...(X_{bn}-X_b(ave))^2]/(n_b-1)$
s_m^2 = 0.000 $= [(X_{m1}-X_m(ave))^2+(X_{m2}-X_m(ave))^2..(X_{mn}-X_m(ave))^2]/(n_m-1)$

T_{star} = -1.048 $= [X_m(ave)-X_b(ave)]/\mathrm{sqrt}(s_m^2/n_m + s_b^2/n_b)$

W_b = 4089.479 $= s_b^2/n_b$
W_m = 0.000 $= s_m^2/n_m$

T_{comp} = 1.706 $= (W_b*T_b + W_m*T_m)/(W_b + W_m)$

There is no significant difference between the monitoring data and the background data or there is a failure of the assumption made for test validity

Groundwater Data Analysis for Non-normal Data

Parameter	Fecal/Ecoli
Up Gradient Data	**Down Gradient Data**
2	1
2	1
2	1
2	1
2	1
2	156
2	
2	
2	
2	
2	
50	
2	
2	
2	
1	
2	
1	
1	
1	
1	
1	
1	
1730	
5	
1	
13	
Minimum 1	**Minimum** 1
Maximum 1730	**Maximum** 156
Is there a significant difference?	
NO	

Permit Number	VA0063037
Facility Name	Huguenot Academy
Parameter	Fecal/Ecoli
Monitoring Well #:	MW7

pH - S.U.

	WELL 1	WELL 3	WELL 4	WELL 5	WELL 6	WELL 7
Jan-01	5.00	4.80				
Mar-01	5.20	6.10				
Jun-01	5.10	6.60				
Oct-01	6.10	5.50				
Dec-01	5.10	NDR				
Jun-02	4.90	NDR				
Mar-03	4.90	5.50				
Jun-03	6.50	5.70				
Aug-03	4.80	5.50				
Nov-03	4.30	5.00				
Mar-04	7.20	7.20				
Jun-04	6.78	6.96				
Nov-04	5.75	5.61	5.63			
Jan-05	5.35	5.71	5.36			
Jun-05	5.35	5.71	5.36			
Sep-05	5.65	5.56	NDR			
Dec-05	6.40	6.59	NDR			
Mar-06	7.32	6.21	6.23			
May-06	5.85	6.00	NDR			
Sep-06	6.54	6.39	NDR			
Nov-06	5.16	6.38	6.09			
Feb-07	4.11	4.25	4.95	4.24	5.68	4.73
Jun-07	5.78	5.29	5.15	5.34	5.86	5.76
Sep-07	6.02	6.23	NDR	6.25	5.85	6.50
Dec-07	6.00	NDR	NDR	5.98	NDR	6.51
Mar-08	5.51	5.30	NDR	5.41	5.54	5.26
Jun-08	6.16	6.15	6.17	6.14	6.15	6.14

NDR: No Data Reported

0: Below Quantification Level

NDR = No Data Reported

0 indicates below quantifiable limit

Groundwater Data Analysis for Non-normal Data

Parameter	pH
Up Gradient Data	**Down Gradient Data**
5	4.8
5.2	6.1
5.1	6.6
6.1	5.5
5.1	
4.9	
4.9	5.5
6.5	5.7
4.8	5.5
4.3	5
7.2	7.2
6.78	6.96
5.75	5.61
5.35	5.71
5.35	5.71
5.65	5.56
6.4	6.59
7.32	6.21
5.85	6
6.54	6.39
5.16	6.38
4.11	4.25
5.78	5.29
6.02	6.23
6	
5.51	5.3
6.16	6.15
Minimum 4.11	**Minimum** 4.25
Maximum 7.32	**Maximum** 7.2
Is there a significant difference?	
Lower Range	**Upper Range**
No	**No**

Permit Number	VA0063037
Facility Name	Huguenot Academy
Parameter	pH
Monitoring Well #:	MW3

Groundwater Data Analysis for Non-normal Data

Parameter	pH
Up Gradient Data	Down Gradient Data
5	5.63
5.2	5.36
5.1	5.36
6.1	6.23
5.1	6.09
4.9	4.95
4.9	5.15
6.5	6.17
4.8	6.15
4.3	
7.2	
6.78	
5.75	
5.35	
5.35	
5.65	
6.4	
7.32	
5.85	
6.54	
5.16	
4.11	
5.78	
6.02	
6	
5.51	
6.16	
Minimum 4.11	Minimum 4.95
Maximum 7.32	Maximum 6.23
Is there a significant difference?	
Lower Range	Upper Range
No	No

Permit Number	VA0063037
Facility Name	Huguenot Academy
Parameter	pH
Monitoring Well #:	MW4

Groundwater Data Analysis for Non-normal Data

Parameter	pH
Up Gradient Data	**Down Gradient Data**
5	4.24
5.2	5.34
5.1	6.25
6.1	5.98
5.1	5.41
4.9	6.14
4.9	
6.5	
4.8	
4.3	
7.2	
6.78	
5.75	
5.35	
5.35	
5.65	
6.4	
7.32	
5.85	
6.54	
5.16	
4.11	
5.78	
6.02	
6	
5.51	
6.16	
Minimum 4.11	**Minimum** 4.24
Maximum 7.32	**Maximum** 6.25
Is there a significant difference?	
Lower Range	**Upper Range**
No	**No**

Permit Number	VA0063037
Facility Name	Huguenot Academy
Parameter	pH
Monitoring Well #:	MW5

Groundwater Data Analysis for Non-normal Data

Parameter	pH
Up Gradient Data	Down Gradient Data
5	5.68
5.2	5.86
5.1	5.85
6.1	5.54
5.1	6.15
4.9	
4.9	
6.5	
4.8	
4.3	
7.2	
6.78	
5.75	
5.35	
5.35	
5.65	
6.4	
7.32	
5.85	
6.54	
5.16	
4.11	
5.78	
6.02	
6	
5.51	
6.16	
Minimum 4.11	Minimum 5.54
Maximum 7.32	Maximum 6.15
Is there a significant difference?	
Lower Range	Upper Range
No	**No**

Permit Number	VA0063037
Facility Name	Huguenot Academy
Parameter	pH
Monitoring Well #:	MW6

Groundwater Data Analysis for Non-normal Data

Parameter	pH
Up Gradient Data	Down Gradient Data
5	4.73
5.2	5.76
5.1	6.5
6.1	6.51
5.1	5.26
4.9	6.14
4.9	
6.5	
4.8	
4.3	
7.2	
6.78	
5.75	
5.35	
5.35	
5.65	
6.4	
7.32	
5.85	
6.54	
5.16	
4.11	
5.78	
6.02	
6	
5.51	
6.16	
Minimum 4.11	Minimum 4.73
Maximum 7.32	Maximum 6.51
Is there a significant difference?	
Lower Range	Upper Range
No	No

Permit Number	VA0063037
Facility Name	Huguenot Academy
Parameter	pH
Monitoring Well #:	MW7

Chlorides - mg/L

	WELL 1	WELL 3	WELL 4	WELL 5	WELL 6	WELL 7
Jan-01	4	5				
Mar-01	5	6				
Jun-01	3	6				
Oct-01	3	4				
Dec-01	3	NDR				
Jun-02	4	NDR				
Mar-03	5	8				
Jun-03	4	10				
Aug-03	<1.0	11				
Nov-03	3	11				
Mar-04	3	11				
Jun-04	4	18				
Nov-04	5	11	0.1			
Jan-05	5	15	0			
Jun-05	5	10	0			
Sep-05	5.2	8.8	NDR			
Dec-05	5	9	NDR			
Mar-06	4.5	10	<1			
May-06	4.6	8.7	NDR			
Sep-06	4.5	8.86	NDR			
Nov-06	3.1	9.9	3.66			
Feb-07	27	7.7	0.21	27	7.7	11
Jun-07	3.8	16	<0.1	30	3.6	19
Sep-07	4.1	4.1	NDR	22	8.4	7.2
Dec-07	4.1	NDR	NDR	24.9	NDR	NDR
Mar-08	3.7	9.6	NDR	24.2	21.9	8.1
Jun-08	3.3	13.3	<0.1	24.6	13.9	13.6

NDR: No Data Reported
0: Below Quantification Level

Cochran's Approximation to the Behrens-Fisher Student's t-Test (at a 5% Level of Significance)

Permit Number	VA0063037
Facility Name	Huguenot Academy
Parameter	Chloride
Monitoring Well #:	MW3
What is the number of observations in the set of background data (n_b)?	27
What is the number of observations in the set of monitoring data (n_m)?	24

	Background	Monitored Site	$[X_b-X_b(ave)]^2$	$[X_m-X_m(ave)]^2$
1	4	5	0.658	21.762
2	5	6	0.036	13.432
3	3	6	3.280	13.432
4	3	4	3.280	32.092
5	3	8	3.280	2.772
6	4	10	0.658	0.112
7	5	11	0.036	1.782
8	4	11	0.658	1.782
9	1	11	14.525	1.782
10	3	18	3.280	69.472
11	3	11	3.280	1.782
12	4	15	0.658	28.462
13	5	10	0.036	0.112
14	5	8.8	0.036	0.748
15	5	9	0.036	0.442
16	5.2	10	0.151	0.112
17	5	8.7	0.036	0.931
18	4.5	8.86	0.097	0.648
19	4.6	9.9	0.045	0.055
20	4.5	7.7	0.097	3.861
21	3.1	16	2.928	40.132
22	27	4.1	492.347	30.969
23	3.8	13.3	1.022	13.213
24	4.1	9.6	0.506	0.004
25	4.1	0	0.506	0.000
26	3.7	0	1.235	0.000
27	3.3	0	2.283	0.000
28	0	0	0.000	0.000
29	0	0	0.000	0.000
30	0	0	0.000	0.000
31	0	0	0.000	0.000
32	0	0	0.000	0.000
33	0	0	0.000	0.000
34	0	0	0.000	0.000
35	0	0	0.000	0.000
36	0	0	0.000	0.000
37	0	0	0.000	0.000
38	0	0	0.000	0.000
39	0	0	0.000	0.000
40	0	0	0.000	0.000

$X_b(ave)$ = 4.811 $X_m(ave)$ = 9.665

T_b = 1.706 (from lookup table)
T_m = 1.714

s_b^2 = 20.576 $= [(X_{b1}-X_b(ave))^2+(X_{b2}-X_b(ave))^2...(X_{bn}-X_b(ave))^2]/(n_b-1)$
s_m^2 = 12.169 $= [(X_{m1}-X_m(ave))^2+(X_{m2}-X_m(ave))^2..(X_{mn}-X_m(ave))^2]/(n_m-1)$

T_{star} = 4.309 $= [X_m(ave)-X_b(ave)]/\mathrm{sqrt}(s_m^2/n_m + s_b^2/n_b)$

W_b = 0.762 $= s_b^2/n_b$
W_m = 0.507 $= s_m^2/n_m$

T_{comp} = 1.709196213 $= (W_b*T_b + W_m*T_m)/(W_b + W_m)$

There is a significant increase in this parameter

Groundwater Data Analysis for Non-normal Data

Parameter	Chloride
Up Gradient Data	**Down Gradient Data**
4	0.1
5	
3	
3	1
3	3.66
4	0.21
5	0.1
4	0.1
1	
3	
3	
4	
5	
5	
5	
5.2	
5	
4.5	
4.6	
4.5	
3.1	
27	
3.8	
4.1	
4.1	
3.7	
3.3	
Minimum 1	**Minimum** 0.1
Maximum 27	**Maximum** 3.66
Is there a significant difference?	
NO	

Permit Number	VA0063037
Facility Name	Huguenot Academy
Parameter	Chloride
Monitoring Well #:	MW4

Groundwater Data Analysis for Non-normal Data

Parameter	Chloride
Up Gradient Data	**Down Gradient Data**
4	27
5	30
3	22
3	24.9
3	24.2
4	24.6
5	
4	
1	
3	
3	
4	
5	
5	
5	
5.2	
5	
4.5	
4.6	
4.5	
3.1	
27	
3.8	
4.1	
4.1	
3.7	
3.3	
Minimum 1	**Minimum** 22
Maximum 27	**Maximum** 30

Is there a significant difference?

YES

Permit Number	VA0063037
Facility Name	Huguenot Academy
Parameter	Chloride
Monitoring Well #:	MW5

Cochran's Approximation to the Behrens-Fisher Student's t-Test (at a 5% Level of Significance)

Permit Number	VA0063037
Facility Name	Huguenot Academy
Parameter	Chloride
Monitoring Well #:	MW6
What is the number of observations in the set of background data (n_b)?	27
What is the number of observations in the set of monitoring data (n_m)?	5

	Background	Monitored Site	$[X_b-X_b(ave)]^2$	$[X_m-X_m(ave)]^2$
1	4	7.7	0.658	11.560
2	5	3.6	0.036	56.250
3	3	8.4	3.280	7.290
4	3	13.9	3.280	7.840
5	3	21.9	3.280	116.640
6	4	0	0.658	0.000
7	5	0	0.036	0.000
8	4	0	0.658	0.000
9	1	0	14.525	0.000
10	3	0	3.280	0.000
11	3	0	3.280	0.000
12	4	0	0.658	0.000
13	5	0	0.036	0.000
14	5	0	0.036	0.000
15	5	0	0.036	0.000
16	5.2	0	0.151	0.000
17	5	0	0.036	0.000
18	4.5	0	0.097	0.000
19	4.6	0	0.045	0.000
20	4.5	0	0.097	0.000
21	3.1	0	2.928	0.000
22	27	0	492.347	0.000
23	3.8	0	1.022	0.000
24	4.1	0	0.506	0.000
25	4.1	0	0.506	0.000
26	3.7	0	1.235	0.000
27	3.3	0	2.283	0.000
28	0	0	0.000	0.000
29	0	0	0.000	0.000
30	0	0	0.000	0.000
31	0	0	0.000	0.000
32	0	0	0.000	0.000
33	0	0	0.000	0.000
34	0	0	0.000	0.000
35	0	0	0.000	0.000
36	0	0	0.000	0.000
37	0	0	0.000	0.000
38	0	0	0.000	0.000
39	0	0	0.000	0.000
40	0	0	0.000	0.000

$X_b(ave)$ = 4.811 $X_m(ave)$ = 11.100

T_b = 1.706 (from lookup table)

T_m = 2.132

s_b^2 = 20.576 $= [(X_{b1}-X_b(ave))^2+(X_{b2}-X_b(ave))^2...(X_{bn}-X_b(ave))^2]/(n_b-1)$

s_m^2 = 49.895 $= [(X_{m1}-X_m(ave))^2+(X_{m2}-X_m(ave))^2..(X_{mn}-X_m(ave))^2]/(n_m-1)$

T_{star} = 1.919 $= [X_m(ave)-X_b(ave)]/\mathrm{sqrt}(s_m^2/n_m + s_b^2/n_b)$

W_b = 0.762 $= s_b^2/n_b$

W_m = 9.979 $= s_m^2/n_m$

T_{comp} = 2.101774944 $= (W_b*T_b + W_m*T_m)/(W_b + W_m)$

There is no significant difference between the monitoring data and the background data

Cochran's Approximation to the Behrens-Fisher Student's t-Test (at a 5% Level of Significance)

Permit Number	VA0063037
Facility Name	Huguenot Academy
Parameter	Chloride
Monitoring Well #:	MW7
What is the number of observations in the set of background data (n_b)?	27
What is the number of observations in the set of monitoring data (n_m)?	5

	Background	Monitored Site	$[X_b\text{-}X_b(ave)]^2$	$[X_m\text{-}X_m(ave)]^2$
1	4	11	0.658	0.608
2	5	19	0.036	52.128
3	3	7.2	3.280	20.976
4	3	13.6	3.280	3.312
5	3	8.1	3.280	13.542
6	4	0	0.658	0.000
7	5	0	0.036	0.000
8	4	0	0.658	0.000
9	1	0	14.525	0.000
10	3	0	3.280	0.000
11	3	0	3.280	0.000
12	4	0	0.658	0.000
13	5	0	0.036	0.000
14	5	0	0.036	0.000
15	5	0	0.036	0.000
16	5.2	0	0.151	0.000
17	5	0	0.036	0.000
18	4.5	0	0.097	0.000
19	4.6	0	0.045	0.000
20	4.5	0	0.097	0.000
21	3.1	0	2.928	0.000
22	27	0	492.347	0.000
23	3.8	0	1.022	0.000
24	4.1	0	0.506	0.000
25	4.1	0	0.506	0.000
26	3.7	0	1.235	0.000
27	3.3	0	2.283	0.000
28	0	0	0.000	0.000
29	0	0	0.000	0.000
30	0	0	0.000	0.000
31	0	0	0.000	0.000
32	0	0	0.000	0.000
33	0	0	0.000	0.000
34	0	0	0.000	0.000
35	0	0	0.000	0.000
36	0	0	0.000	0.000
37	0	0	0.000	0.000
38	0	0	0.000	0.000
39	0	0	0.000	0.000
40	0	0	0.000	0.000

$X_b(ave)$ = 4.811 $X_m(ave)$ = 11.780

T_b = 1.706 (from lookup table)
T_m = 2.132

s_b^2 = 20.576 $= [(X_{b1}-X_b(ave))^2+(X_{b2}-X_b(ave))^2...(X_{bn}-X_b(ave))^2]/(n_b-1)$
s_m^2 = 22.642 $= [(X_{m1}-X_m(ave))^2+(X_{m2}-X_m(ave))^2..(X_{mn}-X_m(ave))^2]/(n_m-1)$

T_{star} = **3.030** $= [X_m(ave)-X_b(ave)]/\mathrm{sqrt}(s_m^2/n_m + s_b^2/n_b)$

W_b = 0.762 $= s_b^2/n_b$
W_m = 4.528 $= s_m^2/n_m$

T_{comp} = **2.07063516** $= (W_b*T_b + W_m*T_m)/(W_b + W_m)$

There is a significant increase in this parameter

Ammonia - mg/L

	WELL 1	WELL 3	WELL 4	WELL 5	WELL 6	WELL 7
Jan-01	0.2	0				
Mar-01	0.4	0				
Jun-01	0	0.1				
Oct-01	0	0				
Dec-01	0	NDR				
Jun-02	0	NDR				
Mar-03	1.3	1.4				
Jun-03	0	0.2				
Aug-03	0.3	0.2				
Nov-03	0.4	0.6				
Mar-04	0	0				
Jun-04	0	0				
Nov-04	0.3	0.2	0.1			
Jan-05	0	0	0			
Jun-05	0	0	0			
Sep-05	0	0	NDR			
Dec-05	0	0	NDR			
Mar-06	0.11	0	0			
May-06	0	0	NDR			
Sep-06	0	0	NDR			
Nov-06	0.14	0	3.66			
Feb-07	2.6	0.24	0.21	2.6	0.24	0.12
Jun-07	0	0	0	0.26	0	0
Sep-07	0	0	NDR	0.43	0	0
Dec-07	0	NDR	NDR	1.07	NDR	0
Mar-08	0	0	NDR	0.6	0	0
Jun-08	0	0	0	0.38	0	0

NDR: No Data Reported
0: Below Quantification Level

Groundwater Data Analysis for Non-normal Data

Parameter	Ammonia
Up Gradient Data	**Down Gradient Data**
0.2	
0.4	
	0.1
	NDR
	NDR
1.3	1.4
	0.2
0.3	0.2
0.4	0.6
0.3	0.2
0.11	
0.14	
2.6	0.24
	NDR
Minimum 0.11	**Minimum** 0.1
Maximum 2.6	**Maximum** 1.4
Is there a significant difference?	
NO	

Permit Number	VA0063037
Facility Name	Huguenot Academy
Parameter	Ammonia
Monitoring Well #:	MW3

Groundwater Data Analysis for Non-normal Data

Parameter	Ammonia
Up Gradient Data	**Down Gradient Data**
0.2	0.1
0.4	
	1
	3.66
	0.21
1.3	0.1
	0.1
0.3	
0.4	
0.3	
0.11	
0.14	
2.6	
Minimum 0.11	**Minimum** 0.1
Maximum 2.6	**Maximum** 3.66
Is there a significant difference?	
YES	

Permit Number	VA0063037
Facility Name	Huguenot Academy
Parameter	Ammonia
Monitoring Well #:	MW~~3~~4

Cochran's Approximation to the Behrens-Fisher Student's t-Test (at a 5% Level of Significance)

Permit Number	VA0063037
Facility Name	Huguenot Academy
Parameter	Ammonia
Monitoring Well #:	MW5
What is the number of observations in the set of background data (n_b)?	27
What is the number of observations in the set of monitoring data (n_m)?	6

	Background	Monitored Site	$[X_b-X_b(ave)]^2$	$[X_m-X_m(ave)]^2$
1	0.2	2.6	0.000	2.924
2	0.4	0.26	0.035	0.397
3	0	0.43	0.045	0.212
4	0	1.07	0.045	0.032
5	0	0.6	0.045	0.084
6	0	0.38	0.045	0.260
7	1.3	0	1.182	0.000
8	0	0	0.045	0.000
9	0.3	0	0.008	0.000
10	0.4	0	0.035	0.000
11	0	0	0.045	0.000
12	0	0	0.045	0.000
13	0.3	0	0.008	0.000
14	0	0	0.045	0.000
15	0	0	0.045	0.000
16	0	0	0.045	0.000
17	0	0	0.045	0.000
18	0.11	0	0.011	0.000
19	0	0	0.045	0.000
20	0	0	0.045	0.000
21	0.14	0	0.005	0.000
22	2.6	0	5.698	0.000
23	0	0	0.045	0.000
24	0	0	0.045	0.000
25	0	0	0.045	0.000
26	0	0	0.045	0.000
27	0	0	0.045	0.000
28	0	0	0.000	0.000
29	0	0	0.000	0.000
30	0	0	0.000	0.000
31	0	0	0.000	0.000
32	0	0	0.000	0.000
33	0	0	0.000	0.000
34	0	0	0.000	0.000
35	0	0	0.000	0.000
36	0	0	0.000	0.000
37	0	0	0.000	0.000
38	0	0	0.000	0.000
39	0	0	0.000	0.000
40	0	0	0.000	0.000

$X_b(ave)$ = 0.213 $X_m(ave)$ = 0.890

T_b = 1.706 (from lookup table)
T_m = 2.015

s_b^2 = 0.300 $= [(X_{b1}-X_b(ave))^2+(X_{b2}-X_b(ave))^2 ... (X_{bn}-X_b(ave))^2]/(n_b-1)$
s_m^2 = 0.782 $= [(X_{m1}-X_m(ave))^2+(X_{m2}-X_m(ave))^2 .. (X_{mn}-X_m(ave))^2]/(n_m-1)$

T_{star} = **1.800** $= [X_m(ave)-X_b(ave)]/\text{sqrt}(s_m^2/n_m + s_b^2/n_b)$

W_b = 0.011 $= s_b^2/n_b$
W_m = 0.130 $= s_m^2/n_m$

T_{comp} = **1.99073019** $= (W_b*T_b + W_m*T_m)/(W_b + W_m)$

There is no significant difference between the monitoring data and the background data

Groundwater Data Analysis for Non-normal Data

Parameter	Ammonia
Up Gradient Data	**Down Gradient Data**
0.2	0.24
0.4	
1.3	
0.3	
0.4	
0.3	
0.11	
0.14	
2.6	
Minimum 0.11	**Minimum** 0.24
Maximum 2.6	**Maximum** 0.24
Is there a significant difference?	
NO	

Permit Number	VA0063037
Facility Name	Huguenot Academy
Parameter	Ammonia
Monitoring Well #:	MW6

Groundwater Data Analysis for Non-normal Data

Parameter	Ammonia
Up Gradient Data	**Down Gradient Data**
0.2	0.12
0.4	
	0.1
1.3	
0.3	
0.4	
0.3	
0.11	
0.14	
2.6	
Minimum 0.11	**Minimum** 0.1
Maximum 2.6	**Maximum** 0.12
Is there a significant difference?	
[redacted]	
NO	

Permit Number	VA0063037
Facility Name	Huguenot Academy
Parameter	Ammonia
Monitoring Well #:	MW7

Nitrate - mg/L

	WELL 1	WELL 3	WELL 4	WELL 5	WELL 6	WELL 7
Jan-01	2.3	0.9				
Mar-01	2.8	0.9				
Jun-01	2.7	1.9				
Oct-01	2.5	1.4				
Dec-01	2.7	NDR				
Jun-02	2.4	NDR				
Mar-03	3.5	1.8				
Jun-03	2.2	1.7				
Aug-03	0	1.5				
Nov-03	1.4	2.7				
Mar-04	2.4	1.8				
Jun-04	2.6	1.3				
Nov-04	3.1	1.3	6.2			
Jan-05	2.4	1.2	5.9			
Jun-05	3.4	1.2	5.4			
Sep-05	3.8	0.9	NDR			
Dec-05	3.6	1.1	NDR			
Mar-06	3.31	1.28	6.23			
May-06	3.24	1.13	NDR			
Sep-06	2.7	1.02	NDR			
Nov-06	1.32	1.81	4.48			
Feb-07	10.3	1.79	4.28	10.3	1.79	2.38
Jun-07	2.34	1.74	3.35	6.52	0.2	1.32
Sep-07	3.02	1.05	NDR	3.6	1.16	3.13
Dec-07	2.87	NDR	NDR	2.01	NDR	NDR
Mar-08	2.58	1.36	NDR	1.42	3.27	3.06
Jun-08	1.5	1.9	5.8	2.4	2.1	2.4

NDR: No Data Reported
0: Below Quantification Level

Cochran's Approximation to the Behrens-Fisher Student's t-Test (at a 5% Level of Significance)

Permit Number	VA0063037
Facility Name	Huguenot Academy
Parameter	Nitrate
Monitoring Well #:	MW3
What is the number of observations in the set of background data (n_b)?	27
What is the number of observations in the set of monitoring data (n_m)?	24

	Background	Monitored Site	$[X_b-X_b(ave)]^2$	$[X_m-X_m(ave)]^2$
1	2.3	0.9	0.308	0.297
2	2.8	0.9	0.003	0.297
3	2.7	1.9	0.024	0.207
4	2.5	1.4	0.126	0.002
5	2.7	0	0.024	2.088
6	2.4	0	0.207	2.088
7	3.5	1.8	0.416	0.126
8	2.2	1.7	0.429	0.065
9	0.1	1.5	7.589	0.003
10	1.4	2.7	2.116	1.575
11	2.4	1.8	0.207	0.126
12	2.6	1.3	0.065	0.021
13	3.1	1.3	0.060	0.021
14	2.4	1.2	0.207	0.060
15	3.4	1.2	0.297	0.060
16	3.8	0.9	0.893	0.297
17	3.6	1.1	0.555	0.119
18	3.31	1.28	0.207	0.027
19	3.24	1.13	0.148	0.099
20	2.7	1.02	0.024	0.181
21	1.32	1.81	2.356	0.133
22	10.3	1.79	55.431	0.119
23	2.34	1.74	0.265	0.087
24	3.02	1.05	0.027	0.156
25	2.87	0	0.000	0.000
26	2.58	1.36	0.076	0.000
27	1.5	1.9	1.836	0.000
28	0	0	0.000	0.000
29	0	0	0.000	0.000
30	0	0	0.000	0.000
31	0	0	0.000	0.000
32	0	0	0.000	0.000
33	0	0	0.000	0.000
34	0	0	0.000	0.000
35	0	0	0.000	0.000
36	0	0	0.000	0.000
37	0	0	0.000	0.000
38	0	0	0.000	0.000
39	0	0	0.000	0.000
40	0	0	0.000	0.000

$X_b(ave)$ = 2.855 $X_m(ave)$ = 1.445

T_b = 1.706 (from lookup table)
T_m = 1.714

s_b^2 = 2.842 $= [(X_{b1}-X_b(ave))^2+(X_{b2}-X_b(ave))^2...(X_{bn}-X_b(ave))^2]/(n_b-1)$
s_m^2 = 0.359 $= [(X_{m1}-X_m(ave))^2+(X_{m2}-X_m(ave))^2..(X_{mn}-X_m(ave))^2]/(n_m-1)$

T_{star} = **-4.066** $= [X_m(ave)-X_b(ave)]/\mathrm{sqrt}(s_m^2/n_m + s_b^2/n_b)$

W_b = 0.105 $= s_b^2/n_b$
W_m = 0.015 $= s_m^2/n_m$

T_{comp} = **1.706995135** $= (W_b*T_b + W_m*T_m)/(W_b + W_m)$

There is no significant difference between the monitoring data and the background data or there is a failure of the assumption made for test validity

Groundwater Data Analysis for Non-normal Data

Parameter	Nitrate
Up Gradient Data	**Down Gradient Data**
2.3	6.2
2.8	5.9
2.7	5.4
2.5	
2.7	
2.4	6.23
3.5	
2.2	
0.1	4.48
1.4	4.28
2.4	3.35
2.6	
3.1	
2.4	
3.4	5.8
3.8	
3.6	
3.31	
3.24	
2.7	
1.32	
10.3	
2.34	
3.02	
2.87	
2.58	
1.5	
Minimum 0.1	**Minimum** 3.35
Maximum 10.3	**Maximum** 6.23
Is there a significant difference?	
NO	

Permit Number	VA0063037
Facility Name	Huguenot Academy
Parameter	Nitrate
Monitoring Well #:	MW4

Cochran's Approximation to the Behrens-Fisher Student's t-Test (at a 5% Level of Significance)

Permit Number	VA0063037
Facility Name	Huguenot Academy
Parameter	Nitrate
Monitoring Well #:	MW5
What is the number of observations in the set of background data (n_b)?	27
What is the number of observations in the set of monitoring data (n_m)?	6

	Background	Monitored Site	$[X_b-X_b(ave)]^2$	$[X_m-X_m(ave)]^2$
1	2.3	10.3	0.308	35.106
2	2.8	6.52	0.003	4.601
3	2.7	3.6	0.024	0.601
4	2.5	2.01	0.126	5.593
5	2.7	1.42	0.024	8.732
6	2.4	2.4	0.207	3.901
7	3.5	0	0.416	0.000
8	2.2	0	0.429	0.000
9	0.1	0	7.589	0.000
10	1.4	0	2.116	0.000
11	2.4	0	0.207	0.000
12	2.6	0	0.065	0.000
13	3.1	0	0.060	0.000
14	2.4	0	0.207	0.000
15	3.4	0	0.297	0.000
16	3.8	0	0.893	0.000
17	3.6	0	0.555	0.000
18	3.31	0	0.207	0.000
19	3.24	0	0.148	0.000
20	2.7	0	0.024	0.000
21	1.32	0	2.356	0.000
22	10.3	0	55.431	0.000
23	2.34	0	0.265	0.000
24	3.02	0	0.027	0.000
25	2.87	0	0.000	0.000
26	2.58	0	0.076	0.000
27	1.5	0	1.836	0.000
28	0	0	0.000	0.000
29	0	0	0.000	0.000
30	0	0	0.000	0.000
31	0	0	0.000	0.000
32	0	0	0.000	0.000
33	0	0	0.000	0.000
34	0	0	0.000	0.000
35	0	0	0.000	0.000
36	0	0	0.000	0.000
37	0	0	0.000	0.000
38	0	0	0.000	0.000
39	0	0	0.000	0.000
40	0	0	0.000	0.000

$X_b(ave) =$ 2.855 $X_m(ave) =$ 4.375

$T_b =$ 1.706 (from lookup table)
$T_m =$ 2.015

$s_b^2 =$ 2.842 $= [(X_{b1}-X_b(ave))^2+(X_{b2}-X_b(ave))^2...(X_{bn}-X_b(ave))^2]/(n_b-1)$
$s_m^2 =$ 11.707 $= [(X_{m1}-X_m(ave))^2+(X_{m2}-X_m(ave))^2..(X_{mn}-X_m(ave))^2]/(n_m-1)$

T_{star} = **1.060** $= [X_m(ave)-X_b(ave)]/\mathrm{sqrt}(s_m^2/n_m + s_b^2/n_b)$

$W_b =$ 0.105 $= s_b^2/n_b$
$W_m =$ 1.951 $= s_m^2/n_m$

$T_{comp} =$ **1.999182328** $= (W_b*T_b + W_m*T_m)/(W_b + W_m)$

There is no significant difference between the monitoring data and the background data

Cochran's Approximation to the Behrens-Fisher Student's t-Test (at a 5% Level of Significance)

Permit Number	VA0063037
Facility Name	Huguenot Academy
Parameter	Nitrate
Monitoring Well #:	MW6
What is the number of observations in the set of background data (n_b)?	27
What is the number of observations in the set of monitoring data (n_m)?	5

	Background	Monitored Site	$[X_b-X_b(ave)]^2$	$[X_m-X_m(ave)]^2$
1	2.3	1.79	0.308	0.007
2	2.8	0.2	0.003	2.262
3	2.7	1.16	0.024	0.296
4	2.5	0	0.126	2.904
5	2.7	3.27	0.024	2.452
6	2.4	2.1	0.207	0.000
7	3.5	0	0.416	0.000
8	2.2	0	0.429	0.000
9	0.1	0	7.589	0.000
10	1.4	0	2.116	0.000
11	2.4	0	0.207	0.000
12	2.6	0	0.065	0.000
13	3.1	0	0.060	0.000
14	2.4	0	0.207	0.000
15	3.4	0	0.297	0.000
16	3.8	0	0.893	0.000
17	3.6	0	0.555	0.000
18	3.31	0	0.207	0.000
19	3.24	0	0.148	0.000
20	2.7	0	0.024	0.000
21	1.32	0	2.356	0.000
22	10.3	0	55.431	0.000
23	2.34	0	0.265	0.000
24	3.02	0	0.027	0.000
25	2.87	0	0.000	0.000
26	2.58	0	0.076	0.000
27	1.5	0	1.836	0.000
28	0	0	0.000	0.000
29	0	0	0.000	0.000
30	0	0	0.000	0.000
31	0	0	0.000	0.000
32	0	0	0.000	0.000
33	0	0	0.000	0.000
34	0	0	0.000	0.000
35	0	0	0.000	0.000
36	0	0	0.000	0.000
37	0	0	0.000	0.000
38	0	0	0.000	0.000
39	0	0	0.000	0.000
40	0	0	0.000	0.000

$X_b(ave) =$ 2.855 $X_m(ave) =$ 1.704

$T_b =$ 1.706 (from lookup table)
$T_m =$ 2.132

$s_b^2 =$ 2.842 $= [(X_{b1}-X_b(ave))^2+(X_{b2}-X_b(ave))^2...(X_{bn}-X_b(ave))^2]/(n_b-1)$
$s_m^2 =$ 1.980 $= [(X_{m1}-X_m(ave))^2+(X_{m2}-X_m(ave))^2..(X_{mn}-X_m(ave))^2]/(n_m-1)$

$T_{star} =$ **-1.625** $= [X_m(ave)-X_b(ave)]/sqrt(s_m^2/n_m + s_b^2/n_b)$

$W_b =$ 0.105 $= s_b^2/n_b$
$W_m =$ 0.396 $= s_m^2/n_m$

$T_{comp} =$ **2.042552096** $= (W_b*T_b + W_m*T_m)/(W_b + W_m)$

There is no significant difference between the monitoring data and the background data or there is a failure of the assumption made for test validity

Cochran's Approximation to the Behrens-Fisher Student's t-Test (at a 5% Level of Significance)

Permit Number	VA0063037
Facility Name	Huguenot Academy
Parameter	Nitrate
Monitoring Well #:	MW7
What is the number of observations in the set of background data (n_b)?	27
What is the number of observations in the set of monitoring data (n_m)?	4

	Background	Monitored Site	$[X_b-X_b(ave)]^2$	$[X_m-X_m(ave)]^2$
1	2.3	2.38	0.308	0.009
2	2.8	1.32	0.003	1.328
3	2.7	3.13	0.024	0.432
4	2.5	0	0.126	6.113
5	2.7	3.06	0.024	0.000
6	2.4	0	0.207	0.000
7	3.5	0	0.416	0.000
8	2.2	0	0.429	0.000
9	0.1	0	7.589	0.000
10	1.4	0	2.116	0.000
11	2.4	0	0.207	0.000
12	2.6	0	0.065	0.000
13	3.1	0	0.060	0.000
14	2.4	0	0.207	0.000
15	3.4	0	0.297	0.000
16	3.8	0	0.893	0.000
17	3.6	0	0.555	0.000
18	3.31	0	0.207	0.000
19	3.24	0	0.148	0.000
20	2.7	0	0.024	0.000
21	1.32	0	2.356	0.000
22	10.3	0	55.431	0.000
23	2.34	0	0.265	0.000
24	3.02	0	0.027	0.000
25	2.87	0	0.000	0.000
26	2.58	0	0.076	0.000
27	1.5	0	1.836	0.000
28	0	0	0.000	0.000
29	0	0	0.000	0.000
30	0	0	0.000	0.000
31	0	0	0.000	0.000
32	0	0	0.000	0.000
33	0	0	0.000	0.000
34	0	0	0.000	0.000
35	0	0	0.000	0.000
36	0	0	0.000	0.000
37	0	0	0.000	0.000
38	0	0	0.000	0.000
39	0	0	0.000	0.000
40	0	0	0.000	0.000

$X_b(ave)$ = 2.855 $X_m(ave)$ = 2.473

T_b = 1.706 (from lookup table)

T_m = 2.353

s_b^2 = 2.842 $= [(X_{b1}-X_b(ave))^2+(X_{b2}-X_b(ave))^2...(X_{bn}-X_b(ave))^2]/(n_b-1)$

s_m^2 = 2.627 $= [(X_{m1}-X_m(ave))^2+(X_{m2}-X_m(ave))^2..(X_{mn}-X_m(ave))^2]/(n_m-1)$

T_{star} = **-0.438** $= [X_m(ave)-X_b(ave)]/\mathrm{sqrt}(s_m^2/n_m + s_b^2/n_b)$

W_b = 0.105 $= s_b^2/n_b$

W_m = 0.657 $= s_m^2/n_m$

T_{comp} = **2.263636393** $= (W_b*T_b + W_m*T_m)/(W_b + W_m)$

There is no significant difference between the monitoring data and the background data or there is a failure of the assumption made for test validity

TOC - mg/L

	WELL 1	WELL 3	WELL 4	WELL 5	WELL 6	WELL 7
Jan-01	2	7				
Mar-01	13	6				
Jun-01	2	3				
Oct-01	7	12				
Dec-01	6	NDR				
Jun-02	8	NDR				
Mar-03	3	3				
Jun-03	3	2				
Aug-03	2.9	0				
Nov-03	2	3.7				
Mar-04	0	0				
Jun-04	0	0				
Nov-04	3.6	1.7	2.5			
Jan-05	5.2	2.6	1.9			
Jun-05	1.1	0	0.26			
Sep-05	0	0	NDR			
Dec-05	3.1	1.3	NDR			
Mar-06	0	0	<1			
May-06	0	0	NDR			
Sep-06	1.25	1.72	NDR			
Nov-06	1.4	0	15			
Feb-07	1.5	1	3	1.5	1	1.7
Jun-07	1.6	0	3.9	1.3	<1	<1
Sep-07	1.2	1.2	NDR	1.06	1.2	1.9
Dec-07	2.8		NDR	2.4	NDR	NDR
Mar-08	1.4	0	NDR	1.3	<1	<1
Jun-08	1.6	0	13.6	1.3	<1	<1

NDR: No Data Reported
0: Below Quantification Level

Groundwater Data Analysis for Non-normal Data

Parameter	TOC
Up Gradient Data	**Down Gradient Data**
2	7
13	6
2	3
7	12
6	NDR
8	NDR
3	3
3	2
2.9	
2	3.7
3.6	1.7
5.2	2.6
1.1	
3.1	1.3
1.25	1.72
1.4	
1.5	1
1.6	
1.2	1.2
2.8	
1.4	
1.6	
Minimum 1.1	**Minimum** 1
Maximum 13	**Maximum** 12
Is there a significant difference?	
NO	

Permit Number	VA0063037
Facility Name	Huguenot Academy
Parameter	TOC
Monitoring Well #:	MW3

Groundwater Data Analysis for Non-normal Data

Parameter	TOC
Up Gradient Data	**Down Gradient Data**
2	2.5
13	1.9
2	0.26
7	
6	
8	
3	
3	
2.9	15
2	3
	3.9
3.6	
5.2	
1.1	13.6
3.1	
1.25	
1.4	
1.5	
1.6	
1.2	
2.8	
1.4	
1.6	
Minimum 1.1	**Minimum** 0.26
Maximum 13	**Maximum** 15
Is there a significant difference?	
YES	

Permit Number	VA0063037
Facility Name	Huguenot Academy
Parameter	TOC
Monitoring Well #:	MW3

Cochran's Approximation to the Behrens-Fisher Student's t-Test (at a 5% Level of Significance)

Permit Number	VA0063037
Facility Name	Huguenot Academy
Parameter	TOC
Monitoring Well #:	MW5
What is the number of observations in the set of background data (n_b)?	27
What is the number of observations in the set of monitoring data (n_m)?	6

	Background	Monitored Site	$[X_b\text{-}X_b(ave)]^2$	$[X_m\text{-}X_m(ave)]^2$
1	2	1.5	0.585	0.001
2	13	1.3	104.759	0.031
3	2	1.06	0.585	0.174
4	7	2.4	17.937	0.853
5	6	1.3	10.466	0.031
6	8	1.3	27.407	0.031
7	3	0	0.055	0.000
8	3	0	0.055	0.000
9	2.9	0	0.018	0.000
10	2	0	0.585	0.000
11	0	0	7.644	0.000
12	0	0	7.644	0.000
13	3.6	0	0.698	0.000
14	5.2	0	5.930	0.000
15	1.1	0	2.772	0.000
16	0	0	7.644	0.000
17	3.1	0	0.112	0.000
18	0	0	7.644	0.000
19	0	0	7.644	0.000
20	1.25	0	2.295	0.000
21	1.4	0	1.863	0.000
22	1.5	0	1.600	0.000
23	1.6	0	1.357	0.000
24	1.2	0	2.449	0.000
25	2.8	0	0.001	0.000
26	1.4	0	1.863	0.000
27	1.6	0	1.357	0.000
28	0	0	0.000	0.000
29	0	0	0.000	0.000
30	0	0	0.000	0.000
31	0	0	0.000	0.000
32	0	0	0.000	0.000
33	0	0	0.000	0.000
34	0	0	0.000	0.000
35	0	0	0.000	0.000
36	0	0	0.000	0.000
37	0	0	0.000	0.000
38	0	0	0.000	0.000
39	0	0	0.000	0.000
40	0	0	0.000	0.000

$X_b(ave) =$ 2.765 $X_m(ave) =$ 1.477

$T_b =$ 1.706 (from lookup table)
$T_m =$ 2.015

$s_b^2 =$ 8.576 $= [(X_{b1}-X_b(ave))^2+(X_{b2}-X_b(ave))^2...(X_{bn}-X_b(ave))^2]/(n_b-1)$
$s_m^2 =$ 0.224 $= [(X_{m1}-X_m(ave))^2+(X_{m2}-X_m(ave))^2..(X_{mn}-X_m(ave))^2]/(n_m-1)$

$T_{star} =$ **-2.162** $= [X_m(ave)-X_b(ave)]/\mathrm{sqrt}(s_m^2/n_m + s_b^2/n_b)$

$W_b =$ 0.318 $= s_b^2/n_b$
$W_m =$ 0.037 $= s_m^2/n_m$

$T_{comp} =$ **1.738508724** $= (W_b*T_b + W_m*T_m)/(W_b + W_m)$

There is no significant difference between the monitoring data and the background data or there is a failure of the assumption made for test validity

Groundwater Data Analysis for Non-normal Data

Parameter	TOC
Up Gradient Data	**Down Gradient Data**
2	1
13	
2	1.2
7	
6	
8	
3	
3	
2.9	
2	
3.6	
5.2	
1.1	
3.1	
1.25	
1.4	
1.5	
1.6	
1.2	
2.8	
1.4	
1.6	
Minimum 1.1	**Minimum** 1
Maximum 13	**Maximum** 1.2
Is there a significant difference?	
NO	

Permit Number	VA0063037
Facility Name	Huguenot Academy
Parameter	TOC
Monitoring Well #:	MW6

Groundwater Data Analysis for Non-normal Data

Parameter	TOC
Up Gradient Data	**Down Gradient Data**
2	1.7
13	
2	1.9
7	
6	
8	
3	
3	
2.9	
2	
3.6	
5.2	
1.1	
3.1	
1.25	
1.4	
1.5	
1.6	
1.2	
2.8	
1.4	
1.6	
Minimum 1.1	**Minimum** 1.7
Maximum 13	**Maximum** 1.9
Is there a significant difference?	
NO	

Permit Number	VA0063037
Facility Name	Huguenot Academy
Parameter	TOC
Monitoring Well #:	MW7

Total Phosphorus - mg/L

	WELL 1	WELL 3	WELL 4	WELL 5	WELL 6	WELL 7
Jan-01	0.09	0.09				
Mar-01	0.67	1.55				
Jun-01	0.37	0.48				
Oct-01	24.16	1.79				
Dec-01	0.58	1.79				
Jun-02	2.25	NDR				
Mar-03	3.24	2.15				
Jun-03	0	0.45				
Aug-03	0.53	2.73				
Nov-03	0.89	0.58				
Mar-04	1.27	0.63				
Jun-04	0.49	1.32				
Nov-04	0.43	0.68	0.27			
Jan-05	0.74	0.82	4.05			
Jun-05	0.14	0.83	1.9			
Sep-05	0.46	0.44	NDR			
Dec-05	0.44	0.18	NDR			
Mar-06	0.06	0.08	0.51			
May-06	0.07	0.33	NDR			
Sep-06	0.36	0.46	NDR			
Nov-06	<0.05	0.07	0.47			
Feb-07	0.89	0.52	0.84	0.89	0.52	1.61
Jun-07	0.34	0.31	<0.05	0.18	0.46	8.05
Sep-07	0.09	0.09	NDR	0.15	<0.05	0.14
Dec-07	0.51	NDR	NDR	0.14	NDR	7.44
Mar-08	0.42	0.36	NDR	0.14	0.18	0.18
Jun-08	0.57	0.78	11.8	0.09	0.63	0.18

NDR: No Data Reported
0: Below Quantification Level

Groundwater Data Analysis for Non-normal Data

Parameter	otal Phosphoru
Up Gradient Data	**Down Gradient Data**
0.09	0.09
0.67	1.55
0.37	0.48
24.16	1.79
0.58	1.79
2.25	
3.24	2.15
	0.45
0.53	2.73
0.89	0.58
1.27	0.63
0.49	1.32
0.43	0.68
0.74	0.82
0.14	0.83
0.46	0.44
0.44	0.18
0.06	0.08
0.07	0.33
0.36	0.46
<0.05	0.07
0.89	0.52
0.34	0.31
0.09	0.09
0.51	
0.42	0.36
0.57	0.78
Minimum 0.06	**Minimum** 0.07
Maximum 24.16	**Maximum** 2.73
Is there a significant difference?	
NO	

Permit Number	VA0063037
Facility Name	Huguenot Academy
Parameter	Total Phosphorus
Monitoring Well #:	MW5

Groundwater Data Analysis for Non-normal Data

Parameter	otal Phosphor
Up Gradient Data	**Down Gradient Data**
0.09	0.27
0.67	4.05
0.37	1.9
24.16	NDR
0.58	NDR
2.25	0.51
3.24	NDR
	NDR
0.53	0.47
0.89	0.84
1.27	<0.05
0.49	NDR
0.43	NDR
0.74	NDR
0.14	11.8
0.46	
0.44	
0.06	
0.07	
0.36	
<0.05	
0.89	
0.34	
0.09	
0.51	
0.42	
0.57	
Minimum 0.06	**Minimum** 0.27
Maximum 24.16	**Maximum** 11.8
Is there a significant difference?	
NO	

Permit Number	VA0063037
Facility Name	Huguenot Academy
Parameter	Total Phosphorus
Monitoring Well #:	MW6

Groundwater Data Analysis for Non-normal Data

Parameter	otal Phosphor
Up Gradient Data	**Down Gradient Data**
0.09	0.89
0.67	0.18
0.37	0.15
24.16	0.14
0.58	0.14
2.25	0.09
3.24	
0.53	
0.89	
1.27	
0.49	
0.43	
0.74	
0.14	
0.46	
0.44	
0.06	
0.07	
0.36	
<0.05	
0.89	
0.34	
0.09	
0.51	
0.42	
0.57	
Minimum 0.06	**Minimum** 0.09
Maximum 24.16	**Maximum** 0.89
Is there a significant difference?	
NO	

Permit Number	VA0063037
Facility Name	Huguenot Academy
Parameter	Total Phosphorus
Monitoring Well #:	MW5

Cochran's Approximation to the Behrens-Fisher Student's t-Test (at a 5% Level of Significance)

Permit Number	VA0063037
Facility Name	Huguenot Academy
Parameter	Total Phosphorus
Monitoring Well #:	MW6
What is the number of observations in the set of background data (n_b)?	27
What is the number of observations in the set of monitoring data (n_m)?	5

	Background	Monitored Site	$[X_b-X_b(ave)]^2$	$[X_m-X_m(ave)]^2$
1	0.09	0.52	1.942	0.026
2	0.67	0.46	0.662	0.010
3	0.37	0	1.240	0.128
4	24.16	0	514.214	0.128
5	0.58	0.18	0.817	0.032
6	2.25	0.63	0.587	0.000
7	3.24	0	3.085	0.000
8	0	0	2.201	0.000
9	0.53	0	0.910	0.000
10	0.89	0	0.352	0.000
11	1.27	0	0.046	0.000
12	0.49	0	0.987	0.000
13	0.43	0	1.110	0.000
14	0.74	0	0.553	0.000
15	0.14	0	1.806	0.000
16	0.46	0	1.048	0.000
17	0.44	0	1.089	0.000
18	0.06	0	2.027	0.000
19	0.07	0	1.999	0.000
20	0.36	0	1.263	0.000
21	0	0	2.201	0.000
22	0.89	0	0.352	0.000
23	0.34	0	1.308	0.000
24	0.09	0	1.942	0.000
25	0.51	0	0.948	0.000
26	0.42	0	1.131	0.000
27	0.57	0	0.835	0.000
28	0	0	0.000	0.000
29	0	0	0.000	0.000
30	0	0	0.000	0.000
31	0	0	0.000	0.000
32	0	0	0.000	0.000
33	0	0	0.000	0.000
34	0	0	0.000	0.000
35	0	0	0.000	0.000
36	0	0	0.000	0.000
37	0	0	0.000	0.000
38	0	0	0.000	0.000
39	0	0	0.000	0.000
40	0	0	0.000	0.000

$X_b(ave)$ = 1.484 $X_m(ave)$ = 0.358

T_b = 1.706 (from lookup table)
T_m = 2.132

s_b^2 = 21.025 $= [(X_{b1}-X_b(ave))^2+(X_{b2}-X_b(ave))^2...(X_{bn}-X_b(ave))^2]/(n_b-1)$
s_m^2 = 0.081 $= [(X_{m1}-X_m(ave))^2+(X_{m2}-X_m(ave))^2..(X_{mn}-X_m(ave))^2]/(n_m-1)$

T_{star} = -1.263 $= [X_m(ave)-X_b(ave)]/\text{sqrt}(s_m^2/n_m + s_b^2/n_b)$

W_b = 0.779 $= s_b^2/n_b$
W_m = 0.016 $= s_m^2/n_m$

T_{comp} = **1.714699015** $= (W_b*T_b + W_m*T_m)/(W_b + W_m)$

There is no significant difference between the monitoring data and the background data or there is a failure of the assumption made for test validity

Cochran's Approximation to the Behrens-Fisher Student's t-Test (at a 5% Level of Significance)

Permit Number	VA0063037
Facility Name	Huguenot Academy
Parameter	Total Phosphorus
Monitoring Well #:	MW6
What is the number of observations in the set of background data (n_b)?	27
What is the number of observations in the set of monitoring data (n_m)?	6

	Background	Monitored Site	$[X_b-X_b(ave)]^2$	$[X_m-X_m(ave)]^2$
1	0.09	1.61	1.942	1.751
2	0.67	8.05	0.662	26.160
3	0.37	0.14	1.240	7.803
4	24.16	7.44	514.214	20.310
5	0.58	0.18	0.817	7.581
6	2.25	0.18	0.587	7.581
7	3.24	0	3.085	0.000
8	0	0	2.201	0.000
9	0.53	0	0.910	0.000
10	0.89	0	0.352	0.000
11	1.27	0	0.046	0.000
12	0.49	0	0.987	0.000
13	0.43	0	1.110	0.000
14	0.74	0	0.553	0.000
15	0.14	0	1.806	0.000
16	0.46	0	1.048	0.000
17	0.44	0	1.089	0.000
18	0.06	0	2.027	0.000
19	0.07	0	1.999	0.000
20	0.36	0	1.263	0.000
21	0	0	2.201	0.000
22	0.89	0	0.352	0.000
23	0.34	0	1.308	0.000
24	0.09	0	1.942	0.000
25	0.51	0	0.948	0.000
26	0.42	0	1.131	0.000
27	0.57	0	0.835	0.000
28	0	0	0.000	0.000
29	0	0	0.000	0.000
30	0	0	0.000	0.000
31	0	0	0.000	0.000
32	0	0	0.000	0.000
33	0	0	0.000	0.000
34	0	0	0.000	0.000
35	0	0	0.000	0.000
36	0	0	0.000	0.000
37	0	0	0.000	0.000
38	0	0	0.000	0.000
39	0	0	0.000	0.000
40	0	0	0.000	0.000

$X_b(ave)$ = 1.484 $X_m(ave)$ = 2.933

T_b = 1.706 (from lookup table)
T_m = 2.015

s_b^2 = 21.025 $= [(X_{b1}-X_b(ave))^2+(X_{b2}-X_b(ave))^2...(X_{bn}-X_b(ave))^2]/(n_b-1)$
s_m^2 = 14.241 $= [(X_{m1}-X_m(ave))^2+(X_{m2}-X_m(ave))^2..(X_{mn}-X_m(ave))^2]/(n_m-1)$

T_{star} = 0.816 $= [X_m(ave)-X_b(ave)]/sqrt(s_m^2/n_m + s_b^2/n_b)$

W_b = 0.779 $= s_b^2/n_b$
W_m = 2.374 $= s_m^2/n_m$

T_{comp} = **1.938666249** $= (W_b*T_b + W_m*T_m)/(W_b + W_m)$

There is no significant difference between the monitoring data and the background data

5 1037
510-12

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

Peter W. Schmidt
Director

Piedmont Regional Office
Post Office Box 6030
Glen Allen, Virginia 23058
(804) 527-5020

Gerard Seeley, Jr.
Regional Director

December 12, 1995

Huguenot Academy
2501 Academy Road
Powhatan, VA 23139
ATTN: Don W. Deaton, Headmaster

Re: Groundwater Monitoring Plan, Huguenot Academy, Powhatan County

Dear Mr. Deaton:

Our staff has reviewed the referenced groundwater monitoring plan and the plan is approvable. However, the agency's groundwater monitoring procedures are under review.

Should you desire, you may delay implementation of groundwater monitoring until a final decision is reached regarding a revision of groundwater monitoring procedures.

Please call Kyle Winter at 527-5048 if you have any questions.

Sincerely,

J. R. Bell Jr.
Water Permit Manager

VA 0063037
GW

RP

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
PIEDMONT REGIONAL OFFICE
4949-A Cox Road, Glen Allen, Virginia 23060
(804) 527-5020 Fax (804) 527-5106
www.deq.virginia.gov

L. Preston Bryant, Jr.
Secretary of Natural Resources

David K. Paylor
Director

Gerard Seeley, Jr.
Regional Director

JAN 16 2007

Mr. James Fortune
Blessed Sacrament- Huguenot Academy
PO Box 519
Powhatan, VA 23139

RE: Blessed Sacrament- Huguenot Academy Lagoon Groundwater Monitoring, VA0063037

Dear Mr. Houghton:

The Department of Environmental Quality staff received a request from Tom Houghton of Swift Creek Environmental Inc. to modify the current groundwater monitoring plan by replacing fecal coliform testing requirements with E.coli testing requirements. As the permit requires E.coli sampling should chlorine disinfection not be available, this change makes lagoon discharge and groundwater monitoring requirements the same. Additionally, the contract laboratory is certified for E.coli testing (but not for fecal coliform testing); approval of this request allows the permittee to continue with the preferred contract laboratory.

The DEQ hereby approves the requested bacteria sampling requirement change and amends the groundwater monitoring plan, previously approved on December 12, 1005, accordingly. No further permit action is required with respect to this modification.

If you have any questions, please contact Gina Kelly at 804/527-5048 or vial email at vekelly@deq.virginia.gov.

Sincerely,

Curtis J. Linderman, P.E.
Water Permits Manager

Cc: Tom Houghton
file

Kelly,Virginia

From: Kelly,Virginia
Sent: Tuesday, January 09, 2007 2:14 PM
To: 'Swiftcreekinc@aol.com'
Subject: RE: Blessed Sacrament Hug. GW CAP

I'm putting a letter approving the GW plan change (fecal to e coli sampling) and a copy of the CAP approval in the mail this afternoon. Let me know if you don't get it.

Gina Kelly
Department of Environmental Quality
Piedmont Regional Office
Water Permits
804/527-5048
804/527-5106 (fax)

-----Original Message-----
From: Swiftcreekinc@aol.com [mailto:Swiftcreekinc@aol.com]
Sent: Tuesday, January 09, 2007 7:29 AM
To: Kelly,Virginia
Subject: Re: Blessed Sacrament Hug. GW CAP

Yes Gina I believe proceeding with the CAP would help us. I did not know the CAP was approved. Could you please resend the approval letter. I will need something for Blessed to initiate the project. Secondly, I would like to perform E-coli testing if that is possible instead of fecal. Can this letter serve as the request. The only reason why, is that the lab we are using Air, Water, Soil Labs is approved for e-coli and not fecal. It would make it easier unless you want us to switch labs. Your thoughts?
Thanks,

Tom Houghton
Swift Creek Environmental, Inc.

GROUNDWATER MONITORING PLAN

HUGUENOT ACADEMY SEWAGE LAGOON

POWHATAN COUNTY, VIRGINIA

Plan Submitted Pursuant to
Condition of VPDES Permit No. VA0063037

November 1994

Plan Submitted by:

Gene W. Hatcher, P.E.

COMMONWEALTH OF VIRGINIA
GENE W. HATCHER
No. 13067
PROFESSIONAL ENGINEER

TABLE OF CONTENTS

1.0 INTRODUCTION

Huguenot Academy operates a sewage treatment lagoon for onsite sewage treatment of the school. The specifications outlined herein describe the groundwater well placement, construction and sampling plan for this facility pursuant to conditions set forth in VPDES Permit No. VA0063037.

The sewage treatment lagoon is located behind Huguenot Academy located on State Route 603 (see enclosed Vicinity Map). The treatment facilities consist of a stabilization lagoon. This facility has not discharged in the past 10 years.

2.0 MONITORING WELL PLACEMENT, CONSTRUCTION AND REQUIRED SUBMITTALS

2.1 PLACEMENT

The monitoring network for the Huguenot Academy Lagoon will consist of three monitoring wells: one upgradient well, and two down gradient wells shown as MW-1, MW-2, and MW-3, respectively. The proposed location of these three wells is shown on the enclosed sketch.

2.2 CONSTRUCTION AND DRILLING LOGS

Three monitoring wells are to be drilled in compliance with the following specifications.

2.2.1 NEW WELL CONSTRUCTION

Monitoring wells MW-1,MW-2, and MW-3 are to be constructed in compliance with all applicable standards of the Virginia Department of Health and the Department of Environmental Quality. The execution of the work shall be by competent workmen and performed under the direct supervision of an experienced well driller. Casing pipe and well screens shall be the same material throughout the well. The well shall be drilled straight, plumb, and circular from top to bottom. A cross section of a typical well is included as Detail A.

A. Logs of Wells:

1. During the drilling of wells, an accurate log shall be maintained. Rock and soil samples shall be taken each ten (10) feet using standard core drilling methods. The Contractor shall prepare a graphic boring log showing the depths of each type of soil encountered. A copy of the drawing shall be submitted to the Engineer.

2. <u>Driller's Log</u>:

During the drilling of the well, the Contractor shall prepare and keep a complete log setting forth the following:

a) The referenced point for all depth measurements.
b) The depth at which each change of formation occurs.
c) The depth at which the first water was encountered.
d) The location and thickness of the aquifer.
e) The identification of the material of which the aquifer is composed.
f) The depth interval from which each water and formation sample was taken.
g) The depth at which the bore-hole diameter changes.
h) The depth to the static water level (SWL) and observable changes in SWL with well depth.
i) Total depth of completed well.
j) The depth of the surface or sanitary seal, if applicable.
k) The nominal hole diameter of the well bore above and below the casing seal.
l) The quantity of cement installed for the seal, if applicable.
m) The depth and description of the well casing.
n) Data regarding well-screen type, size, and placement in the well bore.
o) The sealing off of water-bearing strata, if any, and the exact location thereof.
p) Any and all other pertinent information required by the well specifications.

B. <u>Abandonment of Wells</u>:

In the possibility that the well is abandoned because of loss of tools or any other cause, the Contractor shall fill the abandoned hole with sand-cement grout and remove the casing in accordance with the Commonwealth of Virginia Health Department Private Well Regulation, Section 3.11. Also, see the attached procedure for abandonment of wells.

C. <u>Outer Casing</u>:

The outer casing and locking cap shall be installed to a depth of at least 3.0 feet and extend above ground to a height of at least 12 inches. The annular space between the outer casing and the walls of the hole shall be filled with cement grout. Acceptable methods of grouting are detailed in AWWA A100-84. After drilling is completed, drilling operations shall not be resumed until grout has properly set.

D. Inner Casing and Screen:

Drilling for the inner casing shall be by an approved method at the required diameter and to the required depth to prevent caving of the hole before or during installation of the gravel pack, well screen and inter casing. The well screen and inner casing shall be lowered into the hole by a method which will allow for control of the rate of fall at all times. The inner casing shall extend a minimum depth of 30 feet. Screen length shall be a minimum of 5.0 feet or as long as needed to reasonably account for seasonal fluctuations of groundwater levels. A threaded or welded plate shall be made of the same material as that used for the screen and casing.

E. Gravel Pack:

The approved gravel pack shall be constructed around the screen by filling the entire space between the screen and walls of the hole in the water bearing stratum. The gravel shall be placed using a method which will ensure continuity of the gravel pack without bridging, voids, or segregation. Dumping filter gravel from the surface of the ground and agitating the well in an effort to settle the filter will not be allowed. The gravel pack shall be installed continuously and without interruption until the gravel has been placed to within 1.0 foot minimum above the top of the screen.

F. Placing Packer:

After the inner casing, screen and gravel pack have been installed, the annular space between the inner casing and walls of the hole shall be sealed using an approved packer up to the bottom of the outer casing. The annular space between the inner and outer casing shall be filled with cement grout.

2.2.2 MATERIALS:

A. PVC screens and casing shall be flush threaded or have the ability to be connected by other mechanical methods that do not introduce contaminants such as glue or solvents into the well.

B. Casing and screens of PVC (Fluorocarbon) should be detergent cleaned (not steamed) prior to installation.

C. Only commercially manufactured screens or slotted casings shall be used to prevent the exposure of fresh PVC (saw cut) edges to the groundwater.

D. Screens shall be 2.0 inches thermoplastic pipe manufactured by a molding, extrusion or some welding process and conform to ASTM F480. Screens shall be provided with perforations which shall consist of either machine-sawed slots, or drilled, edged openings free of burns, chipped edges, or broken pieces on the interior and exterior surfaces of the pipe. The pattern of the openings shall be uniformly spaced around the periphery of the screen.

E. Materials used in the filter pack shall be chemically inert, well rounded and dimensionally stable. Fabric filters shall not be acceptable as filter pack materials. Natural gravel packs are acceptable, if the Contractor has sieve analysis performed to determine the proper screen slot size, and also determines the chemical inertness of the filter pack material in the anticipated environment. The Contractor shall submit to the Engineer the size analysis data for the selected filter pack material.

F. When the filter pack is in a saturated zone, a minimum of two (2) feet of sodium bentonite pellets shall be placed directly over the filter pack.

G. Annular sealant above the bentonite clay pellet seal in the unsaturated zone to the frost line shall be an anti-shrink cement mixture, such as type "K" or equivalent.

H. The concrete cap and apron shall extend outward into a four (4) inch minimum thick apron, extending three (3) feet minimum from the outer limits of the borehole.

I. The untreated sodium bentonite seal shall be placed by dropping directly into the borehole. If a hollow stem auger is used, the bentonite shall be placed between the casing and the inside of the auger stem. In shallow monitoring wells, a tamping device shall be used to compact the clay sealant. In deeper wells, a small amount of formation water may be used, if required to wash the bentonite down the hole.

J. All cement mixtures shall be mixed with clean water and placed in the borehole using a tremie pipe (lowering tube).

K. Formation water shall be used for purging the well. In low yielding water bearing formations, an outside source may be introduced into the well to facilitate well development. Air shall not be used to develop the well.

L. The filter pack shall be a product of a commercial sand and gravel manufacturer, shall be properly sized and graded for the surrounding soil and water worn siliceous gravel, free of flat or elongated pieced, organic matter, or other foreign matter. The gravel shall be of such size as will allow the maximum flow of water into the well and prevent the infiltration of sand and silt. The gradation of the filter gravel shall be such that the uniformity coefficient does not exceed 2.5.

M. Grout shall be neat cement grout consisting of cement and water with not more than 6 gallons of water per sack (94 pounds) of cement. Bentonite clay may be used in conjunction with neat Portland cement to form a grouting mixture. Any bentonite used must be specifically recommended by the manufacturer as being suitable for use as grout material and cannot exceed 6% by weight of the mixture. Portland cement shall conform to ASTM C150-86.

2.3 SUBMITTALS

A. The Contractor shall submit to the Engineer and to the Virginia Department of Environmental Quality, Piedmont Regional Office, P.O. Box 11143, Richmond, Virginia 23230, the following documents complete for each well.

1. GW-2 Form
2. Date/Time of Construction
3. Drilling Method and Drilling Fluid Diameter
4. Borehole Diameter and Casing Diameter
5. Well Depth
6. Drilling and Lithologic Logs
7. Casing Materials
8. Screen Materials and Size
9. Casing and Screen Joint Size
10. Screen Slot Size and Length
11. Filter Pack Material, Size
12. Filter Pack Placement Method
13. Sealant Materials
14. Sealant Volume
15. Sealant Placement Method
16. Surface Seal Construction
17. Well Development Procedure

3.0 WATER QUALITY TESTING

3.1 GENERAL REQUIREMENTS

After completing yield and capacity tests for each well, the Contractor shall secure samples of the water in suitable containers, and at sufficient quantity, to have bacterial, physical, and chemical analysis made by an approved testing laboratory. All sampling and analysis shall be performed in accordance with procedures outlined in the latest edition of the EPA Manual of Methods for Chemical Analysis of Water and Wastewater and AWWA Standard Methods for Examination of Water and Wastewater.

3.2 WATER QUALITY PARAMETERS

The initial sampling of the well by the Contractor shall be evaluated for the following parameters:

Groundwater Elevation
pH
Specific Conductance
Nitrate Nitrogen (NO_3)
Ammonia Nitrogen (NH_3)
Total Organic Carbon (TOC)
Chlorides
Fecal Coliform
Total Phosphorus

Results of all initial testing shall be furnished to the Owner and will be used to establish background levels for the monitoring program.

4.0 GROUNDWATER MONITORING

4.1 GENERAL REQUIREMENTS

Groundwater monitoring will begin in the first quarter after approval of the groundwater monitoring network by the Board's staff. Samples shall be taken during the months of March, June, September, and December. Sampling results shall be reported to the Board's Piedmont Regional Office along with the Discharge Monitoring Report by the 10th day of the following month.

4.2 SAMPLING SCHEDULE

At a minimum, groundwater shall be monitored as follows:

Parameter	Units	Monitoring Requirement Frequency	Sample Type
Groundwater Elevation	Feet*	1/Quarter	Measure
pH	SU	1/Quarter	Grab
Specific Conductance	umhos/cm	1/Quarter	Grab
Nitrate Nitrogen (NO_3)	mg/1	1/Quarter	Grab
Ammonia Nitrogen (NH_3)	mg/1	1/Quarter	Grab
Total Organic Carbon (TOC)	mg/1	1/Quarter	Grab
Chlorides	mg/1	1/Quarter	Grab
Fecal Coliform	N/100 ml	1/Quarter	Grab
Total Phosphorus	mg/1	1/Quarter	Grab

*Groundwater elevations in all wells should be measured to the nearest hundredth of a foot using a referenced datum of mean sea level. Submit groundwater elevations on a site map which depicts groundwater elevations on a site map which depicts groundwater flow direction.

Reports of the groundwater monitoring shall include the analytical detection levels for the above listed parameters. If monitoring information gathered for this facility indicates that there are pollutants that are or may be discharged at a level which will cause or have the reasonable potential to cause an excursion above any applicable State water quality standard or criteria, including narrative standards or criteria for water quality, this permit shall be either modified or alternatively revoked and reissued to include effluent limits necessary to meet water quality standards or criteria.

Following one year of monitoring, the above parameters and frequency of analysis may be adjusted, as appropriate by the Board's staff.

4.3 WELL PURGING PROTOCOLS

Prior to sampling the groundwater monitoring wells, the following purging procedure shall be used:

Each well shall be purged a minimum of three (3) well volumes with a dedicated baiter.

4.4 FIELD AND LABORATORY QA/QC

The testing laboratory selected for monitoring the groundwater wells shall submit their QA/QC protocols for field and laboratory work for review and apparel by DEQ prior to collection the samples.

5.0 APPLICABLE PUBLICATIONS

A. American Society for Testing and Materials (ASTM):

1. ASTM C 150-86 Portland Cement

2. ASTM F 480-88A Thermoplastic Water Well Casing Pipe and Couplings Made in Standard Dimension Ratios (SDR).

B. American Water Works Association (AWWA):

1. AWWA A 100-84 Standard for Water Wells

C. Commonwealth of Virginia:

1. Health Department Private Well Regulations - September 1, 1990.

2. Water Control Board Rules and Standards for Water Wells - July 1, 1988

D. Environmental Protection Agency (EPA):

EPA: Manual of Methods for Chemical Analysis of Water and Wastewater

VICINITY MAP -
HUGUENOT ACADEMY

SCALE 1'=2,000'

APPENDIX

federal register

Tuesday
October 8, 1991

Part II

Environmental Protection Agency

40 CFR Part 136

Guidelines Establishing Test Procedures for Analysis of Pollutants Under Clean Water Act; Final Rule and Technical Amendments

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 136

[FRL 4012-5]

Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule; Technical amendments.

SUMMARY: This action under the Clean Water Act (CWA) section 304(h) amends 40 CFR part 136 to add clarifying footnotes to the lists of approved test procedures, update method citations in Tables IA, IB, IC, ID, and IE to amend the incorporation by reference section of the regulation accordingly, and to correct certain typographical errors and omissions.

EFFECTIVE DATE: This amendment becomes effective on October 8, 1991. The incorporation by reference of the publications listed in this notice are approved by the Director of Federal Register as of October 8, 1991.

FOR FURTHER INFORMATION CONTACT: James J. Lichtenberg Environmental Monitoring Systems Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, Cincinnati, Ohio 45268, Telephone Number: (513) 569-7306.

SUPPLEMENTARY INFORMATION:

I. These technical amendments update the references to analytical methods already approved under section 304(h) to the current editions published by EPA, U.S. Geological Survey, and various standards organizations. No new methods are introduced. EPA has carefully reviewed each cited method for substantive changes between the current editions and the previously cited editions. Methods cited in this amendment that were not previously cited are substantively the same as the approved EPA method and/or were derived from the EPA method.

In publishing the final rule (55 FR 24532, June 15, 1990) approving the Direct Current Plasma (DCP) Atomic Emission Spectrometric Method as an approved Nationwide Alternate Procedure (ATP), EPA inadvertently omitted incorporating the reference to the method into § 136.3(b) "Identification of Test Procedures" under "References, Sources, Costs, and Table Citations". This omission is being corrected in a separate notice by adding reference 32, "Direct Current Plasma (DCP) Optical Emission Spectrometric Method for Trace Elemental Analysis of Water and Wastes, Method #AES0029", 1986—revised 1991, Applied Research Laboratories, Inc., 24911 Avenue Stanford, Valencia, CA 91355, Table IB, Note 33 to that section.

On July 3, 1991 (at 56 FR 30519), EPA proposed to eliminate Freon 113 from all of its environmental test methods because of its association with the depletion of the stratospheric ozone layer. This Rule will affect methods approved under 40 CFR part 136 for Parameter 41—Oil and Grease, i.e., EPA Method 413.1 and Method 5520B of Standard Methods. In the July 3 proposed rule, EPA recommended a solvent mixture, n-hexane+methyl tertiary butyl ether (80+20), as the substitute for Freon 113 in the gravimetric measurement of oil and grease. Based on the public comments and the results of ongoing research this mixture or another solvent will be selected for inclusion in the Final Rule. EPA, at that time, will approve the selected solvent for use under 40 CFR part 136.

The U.S.G.S. Method for fecal streptococci method 30055-77 cited in Table IA was revised in 1985 to include preparation of the KF Streptococcus Agar by boiling in a water bath to avoid scorching the medium. Therefore, the method is fully acceptable.

II. The EPA Method References have been updated to include the 1983 editorially revised edition of "Methods for Chemical Analysis of Water and Wastes" so that this edition or the 1979 edition, whichever is available to the analyst, may be used.

III. The Standard Methods references in Tables IA, IB, IC, ID, and IE are generally updated to the 17th Edition by today's notice. Each approved method was carefully reviewed for substantive changes between the 16th and 17th Editions. With the exception of the Turbidimetric Method for Sulfate, the 17th Edition Methods were found to be technically equivalent to the approved 16th Edition Methods. Therefore, we are updating the Standard Methods citations to the 17th Edition for all but the Turbidimetric Method for Sulfate which will continue to be cited to the 15th Edition. The list of references incorporated into this regulation continues to cite the 13th Edition of Standard Methods to support the titrimetric iodine method for sulfide.

Standard Methods has edited certain previously approved EPA 600 Series Methods for Organic Chemicals in Water to its format and published them in the Standard Methods 17th Edition. EPA has examined the Standard Methods version of these methods and found them to be technically the same as the EPA approved methods. Therefore, EPA by this notice accepts the incorporation by reference of Standard Methods 6210B, 6220B, 6230B, 6410B, 6420B, 6440B, and 6630B for use under 40 CFR. Part 136. These methods are for organic analytes non-pesticides listed in Table 1C and pesticides listed in Table 1D. The listings reflect the numbering system change made in the 17th Edition of Standard Methods.

IV. References in Tables IA, IB, IC, ID, and IE to the American Society for Testing and Materials (ASTM), U.S. Geological Survey (USGS), and or the Association of Official Analytical Chemists (AOAC) Methods have also been updated where appropriate to the most recent editions. The AOAC methods cited reflect the numbering system changes that were made in the 15th Edition of the AOAC Methods.

V. The remaining amendments in this notice are very minor and are typographical or editorial in nature. Tables IA, IB, IC, ID, and IE and the notes to these Tables have been reprinted in their entirety for the convenience of the user.

VI. The Administrative Procedure Act, 5 U.S.C. 551, et seq., authorizes an agency to forego notice and comment rulemaking when the agency for good cause finds that notice and public procedure thereon are impracticable, unnecessary or contrary to the public interest. EPA believes that public comment on these technical amendments is unnecessary because the need for the updates to references and the errors were pointed out and urged by the public; to benefit the public, the updates should be approved and the errors should be corrected as soon as possible. Therefore, notice and public procedure is impracticable, unnecessary, and contrary to the public interest and does not apply to this Technical Amendment notice.

VII. Executive Order 12291 requires each Federal agency to determine if a regulation is a major rule as defined by the order and to prepare and consider regulatory impact analysis for such rules. This technical amendment is not a major regulatory action because it will not have a major financial or adverse impact on the community.

The Regulatory Flexibility Act requires (5 U.S.C. 601 et seq.) EPA to consider the effect of regulations on small entities. This technical amendment will not have a significant effect on a substantial number of small systems.

The Paperwork Reduction Act seeks to minimize the reporting burden on the regulated community, as well as minimize the cost of federal information collection and dissemination. This technical amendment contains no information collection activities and, therefore, no Information Collection Request (ICR) will be submitted to the Office of Management and Budget (OMB) for review in compliance with the Paperwork Reduction Act, 44 U.S.C. 3501 *et seq.*

List of Subjects in 40 CFR Part 136

Incorporation by reference, Water pollution control.

Signature:

Erich Bretthauer,

Assistant Administrator, Office of Research and Development (RD-672)

PART 136—[AMENDED]

The following amendments are made to 40 CFR part 136.

1. The authority citation for part 136 continues to read as follows:

Authority: Secs. 301, 304(h), 307, and 501(a) Pub. L. 95-217, Stat. 1566, et seq. (33 U.S.C. 1251, et seq.) (the Federal Water Pollution Control Act Amendments of 1972 as amended by the Clean Water Act of 1977).

2. In § 136.3, Tables IA, IB, IC, ID, and IE and paragraphs (b), (c), (d) and (e) are revised to read as follows:

§ 136.3 Identification of test procedures.

* * * * *

TABLE IA.—LIST OF APPROVED BIOLOGICAL TEST PROCEDURES

Parameter, units and method	Method [1]	EPA [2]	Reference (method No. or page): Standard methods 17th ed.	ASTM	USGS [3]
Bacteria:					
1. Coliform (fecal), number per 100 ml	MPN, 5 tube, 3 dilution; or, membrane filter (MF) [4], single step.	p. 132 p. 124	9221C 9222D		
2. Coliform (fecal) in presence of chlorine, number per 100 mL	MPN, 5 tube, 3 dilution; or, MF [4], single step [5].	p. 132 p. 124	9221C 9222D		B-0050-85.
3. Coliform (total, number per 100 mL)	MPN, 5 tube, 3 dilution; or, MF [4], single step or two step.	p. 114 p. 106	9221B 9222B		B-0025-85.
4. Coliform (total), in presence of chlorine, number per 100 mL	MPN, 5 tube, dilution; or MF [4] with enrichment.	p. 114 p. 111	9221B 9222B+B.5C		
5. Fecal streptococci, number per 100 mL	MPN, 5 tube, 3 dilution; MF [4]; or, plate count.	p. 139 p. 136 p. 143	9230B 9230C		B-0055-85.

Table IA notes:

[1] The method used must be specified when results are reported.

[2] Bordner, R.H., and J.A. Winter, eds. 1978. "Microbiological Methods for Monitoring the Environment, Water and Waste." Environmental Monitoring Systems Laboratory, U.S. Environmental Protection Agency. EPA-600/8-78-017.

[3] Britton, L.J., and P.E. Greeson, P.E., eds., 1989. "Methods for Collection and Analysis of Aquatic Biological and Microbiological Samples," Techniques of Water Resources Investigations of the U.S. Geological Survey, Techniques of Water Resources Investigations, Book 5, Chapter A4, Laboratory Analysis, U.S. Geographic Survey, U.S. Department of Interior, Reston, Virginia.

[4] A 0.45 μm membrane filter (MF) or other pore size certified by the manufacturer to fully retain organisms to be cultivated, and to be free of extractables which could interfere with their growth.

[5] Because the MF technique usually yields low and variable recovery from chlorinated wastewaters, the Most Probable Number method will be required to resolve any controversies.

TABLE IB.—LIST OF APPROVED INORGANIC TEST PROCEDURES

Parameter, units and method	EPA [1]	Reference (method No. or page): Std. methods 17th Ed.	ASTM	USGS [2]	Other
1. Acidity, as $CaCO_3$, mg/L:					
Electrometric and point or phenolphthalein and point	305.1	2310-B(4a)	D1067-88		
2. Alkalinity, as $CaCO_3$, mg/L:					
Electrometric or colorimetric titration to pH 4.5 manual or	310.1	2320-B	D1067-88	I-1030-85	973.43.[3]
Automated	310.2			I-2030-85	
3. Aluminum—Total [4], mg/L; Digestion [4] followed by:					
AA direct aspiration	202.1	3111D		I-3051-85	
AA furnace	202.2	3113B			
Inductively coupled plasma (ICP)	200.7 [5]				
Direct current plasma (DCP), or			D4190-88		Note 34.
Colorimetric (Eriochrome cyanine R)		3500-Al D			
4. Ammonia (as N), mg/L:					
Manual distillation (at pH 9.5) [6], followed by	350.2	4500-NH_3 B			973.49.[3]
Nesslerization	350.2	4500-NH_3 C	D1426-79(A)	I-3520-85	973.48.[3]
Titration	350.2	4500-NH_3 E			
Electrode	350.3	4500-NH_3 G	D1426-79(D)		
Automated phenate or	350.1	4500-NH_3 H	D1426-79(C)	I-4523-85	
Automated electrode					Note 7.
5. Antimony—Total [4], mg/L:					
Digestion [4] followed by:					
AA direct aspiration	204.1	3111 B			
AA furnace, or	204.2	3111 B			
ICP	200.7 [5]	3120 B			
6. Arsenic—Total [4], mg/L:					
Digestion [4] followed by	206.5				
AA gaseous hydride	206.3	3114	D2972-84(B)	I-3062.85	
AA furnace	206.2	3113-4d			
ICP, or	200.7 [5]				

TABLE IB.—LIST OF APPROVED INORGANIC TEST PROCEDURES—Continued

Parameter, units and method	EPA[1]	Reference (method No. or page) Std. methods 17th Ed.	ASTM	USGS[2]	Other
Colorimetric (SDDC)	206.4	3500-As	D2972-84(A)	I-3060-85	
7. Barium—Total [4], mg/L: Digestion [4] followed by:					
AA direct aspiration	208.1	3111 D			
AA furnace	208.2	3113 B		I-3084-85	
ICP, or	200.7 [5]	3120 B			
DCP					Note 34.
8. Beryllium—Total [4], mg/L; Digestion [4] followed by:					
AA direct aspiration	210.1	3111 D	D3645-84-88(A)	I-3095-85	
AA furnace	210.2	3113 B			
ICP	200.7 [5]	3120 B			
DCP, or			D4190-88		Note 34.
Colorimetric (aluminon)		3500-Be D			
9. Biochemical oxygen demand (BOD_5), mg/L: Dissolved Oxygen Depletion	405.1	5210		I-1578-78 [8]	973.44 [3] p. 17.[9]
10. Boron—Total, mg/L:					
Colorimetric (curcumin)	212.3	4500-B B		I-3112-85	
ICP, or	200.7 [5]	3120 B			
DCP			D4190-88		Note 34.
11. Bromide, mg/L: Titrimetric	320.1		D1246-82 (C)(1988)	I-1125-85	p. S44.[10]
12. Cadmium—Total [4], mg/L; Digestion [4] followed by:					
AA direct aspiration	213.1	3111 B or C	D3557-90 (A or B)	I-3135-85 or I-3136-85.	974.27 [3] p. 37.[9]
AA furnace	213.2	3113 B			
ICP	200.7 [5]	3120 B		I-1472-85	
DCP			D4190-90		Note 34.
Voltametry [11], or			D3557-90(C)		
Colorimetric (Dithizone)		3500-Cd D			
13. Calcium—Total [4], mg/L; Digestion [4] followed by:					
AA direct aspiration	215.1	3111 B	D511-88(B)	I-3152-85	
ICP	200.7 [5]	3120 B			
DCP, or					Note 34.
Titrimetric (EDTA)	215.2	3500-Ca D	D511-88(A)		
14. Carbonaceous biochemical oxygen demand ($CBOD_5$), mg/L [12] Dissolved Oxygen Depletion with nitrification inhibitor		5210 B			
15. Chemical oxygen demand (COD), mg/L; Titrimetric, or	410.1, 410.2 or 410.3	5220 B	D1252-88	I-3560 or I-3562-85	973.46 [3] p. 17.[9]
Spectrophotometric, manual or automated	410.4			I-3561-85	Notes 13 or 14.
16. Chloride, mg/L:					
Titrimetric (silver nitrate)		4500-Cl B	D512-89(B)	I-1183-85	
or (Mercuric nitrate), or	325.3	4500-Cl C	D512-89(A)	I-1184-85	973.51.[3]
Colorimetric, manual or			D512-89(C)	I-1187-85	
Automated (Ferricyanide)	325.1 or 325.2	4500-Cl C		I-2187-85	
17. Chlorine—Total residual, mg/L; Titrimetric:					
Amperometric direct	330.1	4500-Cl D	D1253-76(A)		
Starch end point direct	330.3	4500-Cl B	D1253-76(B) (1985) Part 16.3.		
Back titration either end point [15], or	330.2	4500-Cl C			
DPD-FAS	330.4	4500-Cl F			
Spectrophotometric, DPD	330.5	4500-Cl G			
or Electrode					Note 16.
18. Chromium VI dissolved, mg/L; 0.45 micron filtration followed by:					
AA chelation-extraction, or	218.4	3111 A		I-1232-85	
Colorimetric (Diphenylcarbazide				I-1230-85	307B.[17]
19. Chromium—Total [4], mg/L; Digestion [4] followed by:					
AA direct aspiration	218.1	3111 B	D1687-86(D)	I-3236-85	974.27.[3]
AA chelation-extraction	218.3	3111 C			
AA furnace	218.2	3113 B			
ICP	200.7 [5]	3120 B			
DCP, or			D4190-88		Note 34.
Colorimetric (Diphenylcarbazide)		3500-Cr D	D1687-86(A)		
20. Cobalt—Total [4], mg/L; Digestion [4] followed by:					
AA direct aspiration	219.1 or C	3111 B (A or B)	D3558-90	I-3239-85	p. 37.[9]
AA furnace	219.2	3113 B			
ICP, or	200.7 [5]	3120 B			
DCP			D4190-88		Note 34.
21. Color platinum cobalt units or dominant wavelength, hue, luminance purity:					
Colorimetric (ADMI), or	110.1	2120 E			Note 18.
(Platinum cobalt), or	110.2	2120 B		I-1250-85	
Spectrophotometric	110.3	2120 C			

TABLE IB.—LIST OF APPROVED INORGANIC TEST PROCEDURES—Continued

Parameter, units and method	EPA[1]	Reference (method No. or page)			Other
		Std. methods 17th Ed.	ASTM	USGS[2]	
22. Copper—Total[4], mg/L; Digestion[4] followed by:					
AA direct aspiration	220.1	3111 B or C	D1688-90 (A or B)	I-3270-85 or I-3271-85.	974.27[3] p. 39.[3]
AA furnace,	220.2	3113 B			
ICP	200.7[6]	3120 B			
DCP, or			D4190-88		Note 34.
Colorimetric (Neocuproine), or		3500-Cu D or E	D1688-84(88)(A)		
(Bicinchoninate)					Note 19.
23. Cyanide—Total, mg/L:					
Manual distillation with $MgCl_2$ followed by		4500-CN-C			
Titrimetric, or		4500-CN-D			p. 22.[3]
Spectrophotometric, manual or	335.2	4500-CN-E	D2036-89(A)	I-3300-85	
Automated[5]	335.3		D2036-89(A)		
24. Cyanide amendable to chlorination, mg/L:					
Manual distillation with $MgCl_2$ followed by titrimetric or Spectrophotometric.	335.1	4500-CN-G	D2036-89(B)		
25. Fluoride—Total, mg/L:					
Manual distillation[6] followed by		4500-F-B			
Electrode, manual or	340.2	4500-F-C	D1179-88(B)		
Automated				I-4327-85	
Colorimetric (SPADNS)	340.1	4500-F-D	D1179-80(A) (1988).		
or Automated complexone	340.3	4500-F-E			
26. Gold—Total[4], mg/L; Digestion[4] followed by:					
AA direct aspiration	231.1	3111 B			
AA furnace, or	231.2				
DCP					Note 34.
27. Hardness—Total, as $CaCO_3$, mg/L:					
Automated colorimetric	130.1				
Titrimetric (EDTA), or Ca plus Mg as their carbonates, by inductively coupled plasma or AA direct aspiration. (See Parameters 13 and 33).	130.2	2340 C	D1126-86 (1990)	I-1338-85	973.52B.[3]
28. Hydrogen ion (pH), pH units:					
Electrometric, measurement, or	150.1	4500-H+ B	D1293-84 (A or B) (1990).	I-1586-85	973.41.[3]
Automated electrode					Note 21.
29. Iridium—Total[4], mg/L; Digestion[4] followed by:					
AA direct aspiration or	235.1	3111 B			
AA furnace	235.2				
30. Iron—Total[4], mg/L; Digestion[4] followed by:					
AA direct aspiration	236.1	3111 B or C	D1068-90 (A or B)	I-3381-85	973.27.[3]
AA furnace	236.2	3113 B			
ICP	200.7[6]	3120 B			
DCP, or					Note 34.
Colorimetric (Phenanthroline)		3500-Fe D	D1068-90(D)		Note 22.
31. Kjeldahl nitrogen—Total, (as N), mg/L:		4500-N org B or C	3590-84(A)		
Digestion and distillation followed by:					
Titration	351.3	4500-NH_3 E	D3590-89(A)		973.48.[3]
Nesslerization	351.3	4500-NH_3 C	D3590-89(A)		
Electrode	351.3	4500-NH_3 F or G			
Automated phenate	351.1	4500-NH_3 H		I-4551-78[8]	
Semi-automated block digestor, or	351.2		D3590-89(B)		
Potentiometric	351.4		D3590-89(A)		
32. Lead—Total[4], mg/L; Digestion[4] followed by:					
AA direct aspiration	239.1	3111 B or C	D3559-90 (A or B)	I-3399-85	974.27.[3]
AA furnace	239.2	3113 B			
ICP	200.7[6]	3120 B			
DCP			D4190-88		Note 34.
Voltametry[11], or			D3559-90(C)		
Colorimetric (Dithizone)		3500-Pb D			
33. Magnesium—Total[4], mg/L; Digestion[4] followed by:					
AA direct aspiration	242.1	3111 B	D511-88(B)	I-3447-85	974.27.[3]
ICP	200.7[6]	3120 B			
DCP, or					Note 34.
Gravimetric		3500-mg D	D511-77(A)		
34. Manganese—Total[4], mg/L; Digestion[4] followed by:					
AA direct aspiration	243.1	3111 B or C	D858-90 (A or B)	I-3454-85	974.27.[3]
AA furnace	243.2	3113 B			
ICP	200.7[6]	3120 B			
DCP, or			D4190-88		Note 34.
Colorimetric (Persulfate), or		3500-Mn D	D858-84(A) (1988)		920.203.[3]
(Periodate)					Note 23.
35. Mercury—Total[4], mg/L:					
Cold vapor, manual or	245.1	3112 B	D3223-86	I-3462-85	977.22.[3]
Automated	245.2				
36. Molybdenum—Total[4], mg/L; Digestion[4] followed by:					
AA direct aspiration	246.1	3111 D		I-3490-85	

TABLE IB.—LIST OF APPROVED INORGANIC TEST PROCEDURES—Continued

Parameter, units and method	EPA[1]	Reference (method No. or page) Std. methods 17th Ed.	ASTM	USGS[2]	Other
AA furnace	246.2	3113 B			
ICP, or	200.7[5]	3120 B			
DCP					Note 34.
37. Nickel—Total[4], mg/L; Digestion[4] followed by:					
AA direct aspiration	249.1	3111 B or C	D1886–90 (A or B)	I–3499–85	
AA furnace	249.2	3113 B			
ICP	200.7[5]	3120 B			
DCP, or			D4190–88		Note 34.
Colorimetric (Heptoxime)		3500–Ni D			
38. Nitrate (as N), mg/L;					
Colorimetric (Brucine sulfate) or Nitrate-nitrite N minus Nitrite N (See parameters 39 and 40)	352.1		D992–71		973.50[9], 4190[17], p. 28.[9]
39. Nitrate-nitrite (as N), mg/L;					
Cadmium reduction, Manual or	353.3	4500–NO_3 E	D3867–90(B)		
Automated, or	353.2	4500–NO_3 F	D3867–90(A)	I–4545–85	
Automated hydrazine	353.1	4500–NO_3 H			
40. Nitrite (as N), mg/L; Spectrophotometric:					
Manual or	354.1	4500–NO_2 B	D1254–67		Note 25.
Automated (Diazotization)				I–4540–85	
41. Oil and grease—Total recoverable, mg/L;					
Gravimetric (extraction)	413.1	5520 B			
42. Organic carbon—Total (TOC), mg/L;					
Combustion or oxidation	415.1	5310–B	D2579–85 (A or B)		973.47[9], p. 14.[24]
43. Organic nitrogen (as N), mg/L;					
Total Kjeldahl N (Parameter 31) minus amonia N (Parameter 4)					
44. Orthophosphate (as P), mg/L; Ascorbic acid method:					
Automated, or	365.1	4500–P F		I–4601–85	973.56.[9]
Manual single reagent, or	365.2	4500–P E	D515–88(A)		973.55.[9]
Manual two reagent	365.3				
45. Osmium—Total[4], mg/L; Digestion[4] followed by:					
AA direct aspiration, or	252.1	3111 D			
AA furnace	252.2				
46. Oxygen dissolved, mg/L;					
Winkler (Azide modification), or	360.2	4500–O C	D888–81(C) (1988)	I–1575–78[8]	973.45B.[9]
Electrode	360.1	4500–O G		I–1576–78[8]	
47. Palladium—Total[4], mg/L; Digestion[4] followed by:					
AA direct aspiration, or	253.1	3111 B			p. S27.[10]
AA furnace	253.2				p. S28.[10]
DCP					Note 34.
48. Phenols, mg/L; Manual distillation[26]	420.1		D1783–80 (A or B)		Note 27.
Followed by:					
Colorimetric (4AAP) manual, or	420.1				Note 27.
Automated[19]	420.2				
49. Phosphorus (elemental), mg/L; Gas-liquid chromatography					Note 28.
50. Phosphorus—Total, mg/L:					
Persulfate digestion followed by:	365.2	4500–P–B,5			973.55.[9]
Manual, or	365.2 or 365.3	4500–P–E	D515–88(A)		
Automated ascorbic acid reduction, or	365.1	4500–P–F		I–4600–85	973.56.[9]
Semi-automated block digestor	365.4				
51. Platinum—Total[4], mg/L; Digestion[4] followed by:					
AA direct aspiration	255.1	3111 B			
AA furnace	255.2				
DCP					Note 34.
52. Potassium—total[4], mg/L; Digestion[4] followed by:					
AA direct aspiration	258.1	3111 B		I–3630–85	973.53.[9]
ICP	200.7[5]				
Flame photometric, or		3500–K D	D1428–82(A)		
Colorimetric (Cobaltinitrate)					317B.[17]
53. Residue—Total, mg/L; Gravimetric, 103–105°	160.3	2540 B		I–3750–85	
54. Residue—filterable, mg/L; Gravimetric, 180°	160	2540–C		I–1750–85	
55. Residue—nonfilterable, (TSS), mg/L; Gravimetric, 103–105° post washing of residue.	160.2	2540–D		I–3765–85	
56. Residue—settleable, mg/L; Volumetric, (Imhoff cone), or gravimetric.	160.5	2540 F			
57. Residue—Volatile, mg/L; Gravimetric, 550°	160.4	2540 E		I–3753–85	
58. Rhodium—Total[4], mg/L; Digestion[4] followed by:					
AA direct aspiration, or	265.1	3111 B			
AA furnace	265.2				
59. Ruthenium—Total[4], mg/L; Digestion[4] followed by:					
AA direct aspiration, or	267.1	3111 B			
AA furnace	267.2				
60. Selenium—Total[4], mg/L; Digestion[4] followed by:					
AA furnace	270.2	3113 B			
ICP, or	200.7[5]				
AA gaseous hydride	270.3	3114 B	D3859–88(A)	I–3667–85	

TABLE IB.—LIST OF APPROVED INORGANIC TEST PROCEDURES—Continued

Parameter, units and method	EPA[1]	Reference (method No. or page)			Other
		Std. methods 17th Ed.	ASTM	USGS[2]	
61. Silica—Dissolved, mg/L; 0.45 micron filtration followed by:					
Colorimetric, Manual or	370.1	4500–Si D	D859–88(B)	I–1700–85	
Automated (Molybdosilicate), or				I–2700–85	
ICP	200.7 [6]				
62. Silver—Total [4], mg/L; Digestion [4] followed by:					
AA direct aspiration	272.1	3111 B or C		I–3720–85	973.27 [3], p. 37.[9]
AA furnace	272.2	3113 B			
Colorimetric (Dithizone)					319B.[11]
ICP, or	200.7 [6]				
DCP					Note 34.
63. Sodium—Total [4], mg/L; Digestion [4] followed by:					
AA direct aspiration	273.1	3111 B		I–3735–85	973.54.[3]
ICP	200.7 [6]	3120 B			
DCP, or					Note 34.
Flame photometric		3500–Na D	D1428–82(A)		
64. Specific conductance, micromhos/cm at 25° C:					
Wheatstone bridge	120.1	2510 B	D1125–82(A)	I–1780–85	973.40.[3]
65. Sulfate (as SO_4), mg/L:					
Automated colorimetric (barium chloranilate)	375.1				
Gravimetric, or	375.3	$4500–SO_4^{-2}$ C or D.	D516–82(A) (1988)		925.54.[3]
Turbidimetric	375.4		D516–88		426C.[30]
66. Sulfide (as S), mg/L:					
Titrimetric (Iodine), or	376.1	$4500–S^{-2}$ E		I–3840–85	228A.[11]
Colorimetric (methylene blue)	376.2	$4500–S^{-2}$ D			
67. Sulfite (as SO_3), mg/L:					
Titrimetric (Iodine-iodate)	377.1	$4500–SO_3^{-2}$ B	D1339–84(C)		
68. Surfactants, mg/L:					
Colorimetric (methylene blue)	425.1	5540 C	D2330–88		
69. Temperature,					
C: Thermometric	170.1	2550 B			Note 32.
70. Thallium—Total [4], mg/L; Digestion [4] followed by:					
AA direct aspiration	279.1	3111 B			
AA furnace, or	279.2				
ICP	200.7 [6]				
71. Tin—Total [4], mg/L; Digestion [4] followed by:					
AA direct aspiration, or	282.1	3111 B		I–3850–78 [8]	
AA furnace	282.2	3113 B			
72. Titanium—Total [4], mg/L; Digestion [4] followed by:					
AA direct aspiration	283.1	3111 D			
AA furnace	283.2				
DCP					Note 34.
73. Turbidity, NTU:					
Nephelometric	180.1	2130 B	D1889–88a	I–3860–85	
74. Vanadium—Total [4], mg/L; Digestion [4] followed by:					
AA direct aspiration	286.1	3111 D			
AA furnace	286.2				
ICP	200.7 [6]	3120 B			
DCP, or			D4190–88		Note 34.
Colorimetric (Gallic acid)		3500–V D	D3373–84(A) (1988).		
75. Zinc—Total [4], mg/L; Digestion [4] followed by:					
AA direct aspiration	289.1	3111 (B or C)	D1691–90 (A or B)	I–3900–85	974.27 [3], p. 37.[9]
AA furnace	289.2				
ICP	200.7[6]	3120 B			
DCP, or			D4190–88		Note 34.
Colorimetric (Dithizone) or		3500–Zn E			
(Zincon).		3500–Zn F			Note 33.

Table IB notes:

[1] "Methods for Chemical Analysis of Water and Wastes", Environmental Protection Agency, Environmental Monitoring Systems Laboratory-Cincinnati (EMSL–CI), EPA–600/4–79–020, Revised March 1983 and 1979 where applicable.

[2] Fishman, M. J., et al, "Methods for Analysis of Inorganic Substances in Water and Fluvial Sediments," U.S. Department of the Interior, Techniques of Water—Resource Investigations of the U.S. Geological Survey, Denver, CO, Revised 1989, unless otherwise stated.

[3] "Official Methods of Analysis of the Association of Official Analytical Chemists," methods manual, 15th ed. (1990).

[4] For the determination of total metals the sample is not filtered before processing. A digestion procedure is required to solubilize suspended material and to destroy possible organic-metal complexes. Two digestion procedures are given in "Methods for Chemical Analysis of Water and Wastes, 1979 and 1983." One (Section 4.1.3), is a vigorous digestion using nitric acid. A less vigorous digestion using nitric and hydrochloric acids (section 4.1.4) is preferred; however, the analyst should be cautioned that this mild digestion may not suffice for all samples types. Particularly, if a colorimetric procedure is to be employed, it is necessary to ensure that all organo-metallic bonds be broken so that the metal is in a reactive state. In those situations, the vigorous digestion is to be preferred making certain that at no time does the sample go to dryness. Samples containing large amounts of organic materials would also benefit by this vigorous digestion. Use of the graphite furnace technique, inductively coupled plasma, as well as determinations for certain elements such as arsenic, the noble metals, mercury, selenium, and titanium require a modified digestion and in all cases the method write-up should be consulted for specific instruction and/or cautions.

NOTE: If the digestion included in one of the other approved references is different than the above, the EPA procedure must be used.

Dissolved metals are defined as those constituents which will pass through a 0.45 micron membrane filter. Following filtration of the sample, the referenced procedure for total metals must be followed. Sample digestion for dissolved metals may be omitted for AA (direct aspiration or graphite furnace) and ICP analyses provided the sample solution to be analyzed meets the following criteria:

a. has a low COD (<20)

b. is visibly transparent with a turbidity measurement of 1 NTU or less

c. is colorless with no perceptible odor, and

d. is of one liquid phase and free of particulate or suspended matter following acidification.

[5] The full text of Method 200.7, "Inductively Coupled Plasma Atomic Emission Spectrometric Method for Trace Element Analysis of Water and Wastes," is given at Appendix C of this Part 136.

[6] Manual distillation is not required if comparability data on representative effluent samples are on company file to show that this preliminary distillation step is not necessary; however, manual distillation will be required to resolve any controversies.

[7] Ammonia, Automated Electrode method, Industrial Method Number 379-75 WE, dated February 19, 1976, (Bran & Luebbe (Technicon) AutoAnalyzer II, Bran & Luebbe Analyzing Technologies, Inc., Elmsford, N.Y. 10523.

[8] The approved method is that cited in "Methods for Determination of Inorganic Substances in Water and Fluvial Sediments", USGS TWRI, Book 5, Chapter A1 (1979).

[9] American National Standard on Photographic Processing Effluents, Apr. 2, 1975. Available from ANSI, 1430 Broadway, New York, NY 10018.

[10] "Selected Analytical Methods Approved and Cited by the United States Environmental Protection Agency," Supplement to the Fifteenth Edition of Standard Methods for the Examination of Water and Wastewater (1981).

[11] The use of normal and differential pulse voltage ramps to increase sensitivity and resolution is acceptable.

[12] Carbonaceous biochemical oxygen demand ($CBOD_5$) must not be confused with the traditional BOD_5 test which measures "total BOD." The addition of the nitrification inhibitor is not a procedural option, but must be included to report the $CBOD_5$ parameter. A discharger whose permit requires reporting the traditional BOD_5 may not use a nitrification inhibitor in the procedure for reporting the results. Only when a discharger's permit specifically states $CBOD_5$ is required can the permittee report data using the nitrification inhibitor.

[13] OIC Chemical Oxygen Demand Method, Oceanography International Corporation, 512 West Loop, P.O. Box 2980, College Station, TX 77840.

[14] Chemical Oxygen Demand, Method 8000, Hach Handbook of Water Analysis, 1979, Hach Chemical Company, P.O. Box 389, Loveland, CO 80537.

[15] The back titration method will be used to resolve controversy.

[16] Orion Research Instruction Manual, Residual Chlorine Electrode Model 97-70, 1977, Orion Research Incorporated, 840 Memorial Drive, Cambridge, MA 02138. The calibration graph for the Orion residual chlorine method must be derived using a reagent blank and three standard solutions, containing 0.2, 1.0, and 5.0 ml 0.00281 N potassium iodate/100 ml solution, respectively.

[17] The approved method is that cited in Standard Methods for the Examination of Water and Wastewater, 14th Edition, 1976.

[18] National Council of the Paper Industry for Air and Stream Improvement, (Inc.) Technical Bulletin 253, December 1971.

[19] Copper, Biocinchoinate Method, Method 8506, Hach Handbook of Water Analysis, 1979, Hach Chemical Company, P.O. Box 389, Loveland, CO 80537.

[20] After the manual distillation is completed, the autoanalyzer manifolds in EPA Methods 335.3 (cyanide) or 420.2 (phenols) are simplified by connecting the re-sample line directly to the sampler. When using the manifold setup shown in Method 335.3, the buffer 6.2 should be replaced with the buffer 7.6 found in Method 335.2.

[21] Hydrogen Ion (pH) Automated Electrode Method, Industrial Method Number 378-75WA, October 1976, Bran & Luebbe (Technicon) AutoAnalyzer II, Bran & Luebbe Analyzing Technologies, Inc., Elmsford, N.Y. 10523.

[22] Iron, 1,10-Phenanthroline Method, Method 8008, 1980, Hach Chemical Company, P.O. Box 389, Loveland, CO 80537.

[23] Manganese, Periodate Oxidation Method, Method 8034, Hach Handbook of Wastewater Analysis, 1979, pages 2-113 and 2-117, Hach Chemical Company, Loveland, CO 80537.

[24] Wershaw, R.L., et al, "Methods for Analysis of Organic Substances in Water," Techniques of Water-Resources Investigation of the U.S. Geological Survey, Book 5, Chapter A3, (1972 Revised 1987) p. 14.

[25] Nitrogen, Nitrite, Method 8507, Hach Chemical Company, P.O. Box 389, Loveland, CO 80537.

[26] Just prior to distillation, adjust the sulfuric-acid-preserved sample to pH 4 with 1 + 9 NaOH.

[27] The approved method is cited in Standard Methods for the Examination of Water and Wastewater, 14th Edition. The colorimetric reaction is conducted at a pH of 10.0±0.2. The approved methods are given on pp 576-81 of the 14th Edition: Method 510A for distillation, Method 510B for the manual colorimetric procedure, or Method 510C for the manual spectrophotometric procedure.

[28] R.F. Addison and R.G. Ackman, "Direct Determination of Elemental Phosphorus by Gas-Liquid Chromatography," Journal of Chromatography, vol. 47, No. 3, pp. 421-426, 1970.

[29] Approved methods for the analysis of silver in industrial wastewaters at concentrations of 1 mg/L and above are inadequate where silver exists as an inorganic halide. Silver halides such as the bromide and chloride are relatively insoluble in reagents such as nitric acid but are readily soluble in an aqueous buffer of sodium thiosulfate and sodium hydroxide to pH of 12. Therefore, for levels of silver above 1 mg/L, 20 mL of sample should be diluted to 100 mL by adding 40 mL each of 2 M $Na_2S_2O_3$ and NaOH. Standards should be prepared in the same manner. For levels of silver below 1 mg/L the approved method is satisfactory.

[30] The approved method is that cited in Standard Methods for the Examination of Water and Wastewater, 15th Edition.

[31] The approved method is that cited in Standard Methods for the Examination of Water and Wastewater, 13th Edition.

[32] Stevens, H.H., Ficke, J.F., and Smoot, G.F., "Water Temperature—Influential Factors, Field Measurement and Data Presentation", Techniques of Water-Resources Investigations of the U.S. Geological Survey, Book 1, Chapter D1, 1975.

[33] Zinc, Zincon Method, Method 8009, Hach Handbook of Water Analysis, 1979, pages 2-231 and 2-333, Hach Chemical Company, Loveland, CO 80537.

[34] "Direct Current Plasma (DCP) Optical Emission Spectrometric Method for Trace Elemental Analysis of Water and Wastes, Method AES0029," 1986—Revised 1991, Applied Research Laboratories, Inc., 24911 Avenue Stanford, Valencia, CA 91355.

TABLE 1C.—LIST OF APPROVED TEST PROCEDURES FOR NON-PESTICIDE ORGANIC COMPOUNDS

Parameter[1]	EPA Method Number[2,7]				ASTM	Other
	GC	GC/MS	HPLC	Standard methods 17th Ed.		
1. Acenaphthene	610	625, 1625	610	6410 B, 6440 B	D4657-87	
2. Acenaphthylene	610	625, 1625	610	6410 B, 6440 B	D4657-87	
3. Acrolein	603	[4] 604, 1624				
4. Acrylonitrile	603	[4] 624, 1624	610			
5. Anthracene	610	625, 1625	610	6410 B, 6440 B	D4657-87	
6. Benzene	602	624, 1624		6210 B, 6220 B		
7. Benzidine		[5] 625, 1625	605			Note 3, p.1.
8. Benzo(a)anthracene	610	625, 1625	610	6410 B, 6440 B	D4657-87	
9. Benzo(a)pyrene	610	625, 1625	610	6410 B, 6440 B	D4657-87	
10. Benzo(b)fluoranthene	610	625, 1625	610	6410 B, 6440 B	D4657-87	
11. Benzo(g,h,i)perylene	610	625, 1625	610	6410 B, 6440 B	D4657-87	
12. Benzo(k)fluoranthene	610	625, 1625	610	6410 B, 6440 B	D4657-87	
13. Benzyl chloride						Note 3, p.130; Note 6, p. S102.
14. Benzyl butyl phthalate	606	625, 1625		6410 B		
15. Bis(2-chloroethoxy) methane	611	625, 1625		6410 B		
16. Bis(2-chloroethyl) ether	611	625, 1625		6410 B		
17. Bis (2-ethylhexyl) phthalate	606	625, 1625		6410 B, 6230 B		
18. Bromodichloromethane	601	624, 1624		6210 B, 6230 B		
19. Bromoform	601	624, 1624		6210 B, 6230 B		
20. Bromomethane	601	624, 1624		6210 B, 6230 B		
21. 4-Bromophenylphenyl ether	611	625, 1625		6410 B		
22. Carbon tetrachloride	601	624, 1624		6230 B, 6410 B		Note 3, p.130.
23. 4-Chloro-3-methylphenol	604	625, 1625		6410 B, 6420 B		
24. Chlorobenzene	601, 602	624, 1624		6210 B, 6220 B 6230 B		Note 3, p.130.
25. Chloroethane	601	624, 1624		6210 B, 6230 B		
26. 2-Chloroethylvinyl ether	601	624, 1624		6210 B, 6230 B		

TABLE 1C.—LIST OF APPROVED TEST PROCEDURES FOR NON-PESTICIDE ORGANIC COMPOUNDS—Continued

Parameter[1]	GC	EPA Method Number[2,7] GC/MS	HPLC	Standard methods 17th Ed.	ASTM	Other
27. Chloroform	601	624, 1624		6210 B, 6230 B		Note, p.130.
28. Chloromethane	601	624, 1624		6210 B, 6230 B		
29. 2-Chloronaphthalene	612	625, 1625		6410 B		
30. 2-Chlorophenol	604	625, 1625		6410 B, 6420 B		
31. 4-Chlorophenylphenyl ether	611	625, 1625		6410 B		
32. Chrysene	610	625, 1625	610	6410 B, 6440 B	D4657–87	
33. Dibenzo(a,h)anthracene	610	625, 1625	610	6410 B, 6440 B	D4657–87	
34. Dibromochloromethane	601	624, 1624		6210 B, 6230 B		
35. 1, 2-Dichlorobenzene	601,602,612	624,625,1625		6410 B, 6230 B, 6220 B		
36. 1, 3-Dichlorobenzene	601,602,612	624,625,1625		6410 B, 6230 B; 6220 B		
37. 1, 4-Dichlorobenzene	601,602,612	625,1624,1625		6410 B, 6230 B 6220B		
38. 3, 3-Dichlorobenzidine		625, 1625	605	6410 B		
39. Dichlorodifluoromethane	601			6230 B		
40. 1, 1-Dichloroethane	601	624, 1624		6230 B, 6210 B		
41. 1, 2-Dichloroethane	601	624, 1624		6230 B, 6210 B		
42. 1, 1-Dichloroethene	601	624, 1624		6230 B, 6210 B		
43. trans-1, 2-Dichloroethene	601	624, 1624		6230 B, 6210 B		
44. 2, 4-Dichlorophenol	604	625, 1625		6420 B, 6410 B		
45. 1, 2-Dichloropropane	601	624, 1624		6230 B, 6210 B		
46. cis-1, 3-Dichloropropene	601	624, 1624		6230 B, 6210 B		
47. trans-1, 3-Dichloropropene	601	624, 1624		6230 B, 6210 B		
48. Diethyl phthalate	606	625, 1625		6410 B		
49. 2, 4-Dimethylphenol	604	625, 1625		6420 B, 6410 B		
50. Dimethyl phthalate	606	625, 1625		6410 B		
51. Di-n-butyl phthalate	606	625, 1625		6410 B		
52. Di-n-octyl phthalate	606	625, 1625		6410 B		
53. 2, 3-Dinitrophenol	604	625, 1625		6420 B, 6410 B		
54. 2, 4-Dinitotoluene	609	625, 1625		6410 B		
55. 2, 6-Dinitrotoluene	609	625, 1625		6410 B		
56. Epichlorohydrin						Note 3, p.130 Note 6, p.S102.
57. Ethylbenzene	602	624, 1624		6220 B, 6210 B		
58. Fluoranthe	610	625, 1625	610	6410 B, 6440 B	D4657–87	
59. Fluorene	610	625, 1625	610	6410 B, 6440 B	D4657–87	
60. Hexachlorobenzene	612	625, 1625		6410 B		
61. Hexachlorobutadiene	612	625, 1625		6410 B		
62. Hexachlorocyclopentadiene	612	*625, 1625		6410 B		
63. Hexachloroethane	616	625, 1625		6410 B		
64. Ideno (1,2,3-cd)pyrene	610	625, 1625	610	6410 B, 6440 B	D4657–87	
65. Isophorone	609	625, 1625		6410 B		
66. Methylene chloride	601	624, 1624		6230 B		Note 3, p.130.
67. 2-Methyl-4,6-dinitrophenol	604	625, 1625		6420 B, 6410 B		
68. Naphthalene	610	625, 1625	610	6410 B, 6440 B		
69. Nitrobenezene	609	625, 1625		6410 B	D4657–87	
70. 2-Nitrophenol	604	625, 1625		6410 B, 6420 B		
71. 4-Nitrophenol	604	625, 1625		6410 B, 6420 B		
72. N-Nitrosodimethylamine	607	625, 1625		6410 B		
73. N-Nitrosodi-n-propylamine	607	*625, 1625		6410 B		
74. N-Nitrosodiphenylamine	607	*625, 1625		6410 B		
75. 2,2-Oxybis(1-chloropropane)	611	625, 1625		6410 B		
76. PCB–1016	608	625		6410 B		Note 3, p.43
77. PCB–1221	608	625		6410 B		Note 3, p.43
78. PCB–1232	608	625		6410 B		Note 3, p.43
79. PCB–1242	608	625		6410 B		Note 3, p.43
80. PCB–1248	608	625				
81. PCB–1254	608	625		6410 B		Note 3, p.43
82. PCB–1260	608	625		6410 B, 6630 B		Note 3, p.43.
83. Pentachlorophenol	604	625, 1625		6410 B, 6630 B		Note 3, p.140.
84. Phenanthrene	610	625, 1625	610	6410 B, 6440 B	D4657–87	
85. Phenol	604	625, 1625		6420 B, 6410 B		
86. Pyrene	610	625, 1625	610	6410 B, 6440 B	D4657–87	
87. 2,3,7,8-Tetrachlorodibenzo-p-dioxin		*613				
88. 1,1,2,2-Tetrachloroethane	601	624, 1624		6230 B, 6210 B		Note 3, p.130.
89. Tetrachloroethene	601	624, 1624		6230 B, 6210 B		Note 3, p.130.
90. Toluene	602	624, 1624		6210 B, 6220 B		
91. 1,2,4-Trichlorobenzene	612	625, 1625		6410 B		Note 3, p.130.
92. 1,1,1-Trichloroethane	601	624, 1624		6210 B, 6230 B		
93. 1,1,2-Trichloroethane	601	624, 1624		6210 B, 6230 B		Note 3, p.130.
94. Trichloroethene	601	624, 1624		6210 B, 6230 B		
95. Trichlorofluoromethane	601	624		6210 B, 6230 B		
96. 2,4,6-Trichlorophenol	604	625, 1625		6410 B, 6240 B		
97. Vinyl chloride	601	624, 1624		6210 B, 6230 B		

Table 1C notes:

[1] All parameters are expressed in micrograms per liter (µg/L).
[2] The full text of Methods 601–613, 624, 625, 1624, and 1625, are given at Appendix A, "Test Procedures for Analysis of Organic Pollutants," of this Part 136. The standardized test procedure to be used to determine the method detection limit (MDL) for these test procedures is given at Appendix B, "Definition and Procedure for the Determination of the Method Detection Limit" of this Part 136.
[3] "Methods for Benzidine: Chlorinated Organic Compounds, Pentachlorophenol and Pesticides in Water and Wastewater," U.S. Environmental Protection Agency, September, 1978.
[4] Method 624 may be extended to screen samples for Acrolein and Acrylonitrile. However, when they are known to be present, the preferred method for these two compounds is Method 603 or Method 1624.
[5] Method 625 may be extended to include benzidine, hexachlorocyclopentadiene, N-nitrosodimethylamine, and N-nitrosodiphenylamine. However, when they are known to be present, Methods 605, 607, and 612, or Method 1625, are preferred methods for these compounds.
[5a] 625, Screening only.
[6] "Selected Analytical Methods Approved and Cited by the United States Environmental Protection Agency," Supplement to the Fifteenth Edition of Standard Methods for the Examination of Water and Wastewater (1981).
[7] Each analyst must make an initial, one-time demonstration of their ability to generate acceptable precision and accuracy with Methods 601–603, 624, 625, 1624, and 1625 (See Appendix A of this Part 136) in accordance with procedures each in section 8.2 of each of these Methods. Additionally, each laboratory, on and on-going bases must spike and analyze 10% (5% for Methods 624 and 625 and 100% for Methods 1624 and 1625) of all samples to monitor and evaluate laboratory data quality in accordance with sections 8.3 and 8.4 of these Methods. When the recovery of any parameter falls outside the warning limits, the analytical results for that parameter in the unspiked sample are suspect and cannot be reported to demonstrate regulatory compliance.

NOTE: These warning limits are promulgated as an "interim final action with a request for comments."

TABLE 1 D.—LIST OF APPROVED TEST PROCEDURES FOR PESTICIDES[1]

Parameter µg/L	EPA method number				Other
	Method	EPA[2,7]	Standard methods 17th Ed.	ASTM	
1. Aldrin	GC	608	6630 B & C	D3086–90	Note 3, p. 7; Note 4, p. 30.
	GC/MS	625	6410 B		
2. Ametryn	GC				Note 3, p. 83; Note 6, p. S68.
3. Aminocarb	TLC				Note 3, p. 94; Note 6, p. S16.
4. Atraton	GC				Note 3, p. 83; Note 6, p. S68.
5. Atrazine	GC				Note 3, p. 83; Note 6, p. S68.
6. Azinphos methyl	GC				Note 3, p. 25; Note 6, p. S51.
7. Barban	TLC				Note 3, p. 104; Note 6, p. S64.
8. α-BHC	GC	608	6630 B & C	D3086–90	Note 3, p. 7.
	GC/MS	625	6410 B		
9. β-BHC	GC	608	6630 C	D3086–90	
	GC/MS	625	6410 B		
10. δ-BHC	GC	608	6630 C	D3086–90	
	GC/MS	625	6410 B		
11. γ-BHC (Lindane)	GC	608	6630 B & C	D3086–90	Note 3, p. 7; Note 4, p. 30.
	GC/MS	625	6410 B		
12. Captan	GC		6630 B	D3086–90	Note 3, p. 7.
13. Carbaryl	TLC				Note 3, p. 94; Note 6, p. S60.
14. Carbophenothion	GC				Note 4, p. 30; Note 6, p. S73.
15. Chlordane	GC	608	6630 B & C	D3086–90	Note 3, p. 7.
	GC-MS	625	6410 B		
16. Chloropropham	TLC				Note 3, p. 104; Note 6, p. S64.
17. 2,4–D	GC		6640 B		Note 3, p. 115; Note 4, p. 35.
18. 4,4'–D–DDD	GC	608	6630 B & C	D3086–90	Note 3, p. 7; Note 4, p. 30.
	GC-MS	625	6410B		
19. 4,4'–DDE	GC	608	6630 B & C	D3086–90	Note 3, p. 7; Note 4, p. 30.
	GC-MS	625	6410 B		
20. 4,4'–DDT	GC	608	6630 B & C	D3086–90	Note 3, p. 7; Note 4, p. 30.
	GC-MS	625	6410 B		
21. Demeton–O	GC				Note 3, p. 25; Note 6, p. S51.
22. Demeton–S	GC				Note 3, p. 25; Note 6, p. S51.
23. Diazinon	GC				Note 3, p. 25; Note 4, p. 30; Note 6, p. S51.
24. Dicamba	GC				Note 3, p. 115.
25. Dichlofenthion	GC				Note 4, p. 30; Note 6, p. S73.
26. Dichloran	GC		6630 B & C		Note 3, p. 7.
27. Dicofol	GC			D3086–90	
28. Dieldrin	GC	608	6630 B & C		Note 3, p. 7; Note 4, p. 30.

TABLE 1 D.—LIST OF APPROVED TEST PROCEDURES FOR PESTICIDES[1]—Continued

Parameter μg/L	EPA method number: Method	EPA[2,7]	Standard methods 17th Ed.	ASTM	Other
	GC-MS	625	6410 B		
29. Dioxathion	GC				Note 4, p. 30; Note 6, p. S73.
30. Disulfoton	GC				Note 3, p. 25; Note 6, p. S51.
31. Diuron	TLC				Note 3, p. 104; Note 6, p. S64.
32. Endosulfan I	GC	608	6630 B & C	D3086-90	Note 3, p. 7.
	GC-MS	[5] 625	6410 B		
33. Endosulfan II	GC	608	6630 B & C	D3086-90	Note 3, p. 7.
	GC-MS	[5] 625	6410 B		
34. Endosulfan Sulfate	GC	608	6630 C		
	GC-MS	625	6410 B		
35. Endrin	GC	608	6630 B & C	D3086-90	Note 3, p. 7; Note 4, p. 30.
	GC-MS	[5] 625	6410 B		
36. Endrin aldehyde		GC	608		
37. Ethion	GC				Note 4, p. 30; Note 6, p. S73.
38. Fenuron	TLC				Note 3, p. 104; Note 6, p. S64.
39. Fenuron-TCA	TLC				Note 3, p. 104; Note 6, p. S64.
40. Heptachlor	GC	608	6630 B & C	D3086-90	Note 3, p. 7; Note 4, p. 30.
	GC/MS	625	6410 B		
41. Heptachlor epoxide	GC	608	6630 B & C	D3086-90	Note 3, p. 7; Note 4, p. 30; Note 6, p. S73.
	GC/MS	625	6410 b		
42. Isodrin	GC				Note 4, p. 30; Note 6, p. S73.
43. Linuron	GC				Note 3, p. 104; Note 6, p. S64.
44. Malathion	GC		6630 C		Note 3, p. 25; Note 4, p. 30; Note 6, p. S51.
45. Methiocarb	TLC				Note 3, p. 94; Note 6, p. S60.
46. Methoxychlor	GC		6630 B & C	D3086-90	Note 3, p. 7; Note 4, p. 30.
47. Mexacarbate	TLC				Note 3, p. 94; Note 6, p. S60.
48. Mirex	GC		6630 B & C		Note 3, p. 7.
49. Monuron	TLC				Note 3, p. 104; Note 6, p. S64.
50. Monuron	TLC				Note 3, p. 104; Note 6, p. S64.
51. Nuburon	TLC				Note 3, p. 104; Note 6, p. S64.
52. Parathion methyl	GC		6630 C		Note 3, p. 25; Note 4, p. 30.
53. Parathion ethyl	GC		6630 C		Note 3, p. 25.
54. PCNB	GC		6630 B & C		Note 3, p. 7.
55. Perthane	GC			D3086-90	
56. Prometron	GC				Note 3, p. 83; Note 6, p. S68.
57. Prometryn	GC				Note 3, p. 83; Note 6, p. S68.
58. Propazine	GC				Note 3, p. 83; Note 6, p. S68.
59. Propham	TLC				Note 3, p. 104; Note 6, p. S64.
60. Propoxur	TLC				Note 3, p. 94; Note 6, p. S60.
61. Secbumeton	TLC				Note 3, p. 83; Note 6, p. S68.
62. Siduron	TLC				Note 3, p. 104; Note 6, p. S64.
63. Simazine	GC				Note 3, p. 83; Note 6, p. S68.
64. Strobane	GC		6630 B & C		Note 3, p. 7.
65. Swep	TLC				Note 3, p. 104; Note 6, p. S64.
66. 2,4,5-T	GC		6640 B		Note 3, p. 115; Note 4, p. 35.
67. 2,4,5-TP (Silvex)	GC		6640 B		Note 3, p. 115

TABLE 1D.—LIST OF APPROVED TEST PROCEDURES FOR PESTICIDES[1]—Continued

Parameter µg/L	EPA method number				Other
	Method	EPA[2,7]	Standard methods 17th Ed.	ASTM	
68. Terbuthylazine	GC				Note 3, p. 83; Note 6, p. S68.
69. Toxaphene	GC	608	6630 B & C	D3086-90	Note 3, p. 7; Note 4, p. 30.
70. Trifluralin	GC/MS	625	6410 B		
	GC		6630 B		Note 3, p. 7.

Table 1D Notes:

[1] Pesticides are listed in this table by common name for the convenience of the reader. Additional pesticides may be found under Table 1C, where entries are listed by chemical name.

[2] The full text of Methods 608 and 625 are given at appendix A, "Test Procedures for Analysis of Organic Pollutants," of this part 136. The standardized test procedure to be used to determine the method detection limit (MDL) for these test procedures is given at appendix B, "Definition and Procedure for the Determination of the Method Detection Limit", of this part 136.

[3] "Methods for Benzidine, Chlorinated Organic Compounds, Pentachlorophenol and Pesticides in Water and Wastewater," U.S. Environmental Protection Agency, September, 1978. This EPA publication includes thin-layer chromatography (TLC) methods.

[4] "Methods for Analysis of Organic Substances in Water and Fluvial Sediments," Techniques of Water-Resources Investigations of the U.S. Geological Survey, Book 5, Chapter A3 (1987).

[5] The method may be extended to include α-BHC, δ-BHC, endosulfan I, endosulfan II, and endrin. However, when they are known to exist, Method 608 is the preferred method.

[6] "Selected Analytical Methods Approved and Cited by the United States Environmental Protection Agency," Supplement to the Fifteenth Edition of Standard Methods for the Examination of Water and Wastewater (1981).

[7] Each analyst must make an initial, one-time, demonstration of their ability to generate acceptable precision and accuracy with Methods 608 and 625 (See appendix A of this part 136) in accordance with procedures given in section 8.2 of each of these methods. Additionally, each laboratory, on an on-going basis, must spike and analyze 10% of all samples analyzed with Method 608 or 5% of all samples analyzed with Method 625 to monitor and evaluate laboratory data quality in accordance with Sections 8.3 and 8.4 of these methods. When the recovery of any parameter falls outside the warning limits, the analytical results for that parameter in the unspiked sample are suspect and cannot be reported to demonstrate regulatory compliance. These quality control requirements also apply to the Standard Methods, ASTM Methods, and other Methods cited.

NOTE: These warning limits are promulgated as an "interim final action with a request for comments."

TABLE IE.—LIST OF APPROVED RADIOLOGICAL TEST PROCEDURES

Parameter and units	Method	EPA[1]	Reference (method number or page)		
			Standard methods 17th Ed.	ASTM	USGS[2]
1. Alpha-Total, pCi per liter	Proportional or scintillation counter	900	703	D1943-81	pp. 75 and 78.[3]
2. Alpha-Counting error, pCi per liter	Proportional or scintillation counter	Appendix B	703	D1943-81	p. 79.
3. Beta-Total, pCi per	Proportional counter	900.0	703	D1890-81	pp. 75 and 78.[3]
4. Beta-Counting error, pCi	Proportional counter	Appendix B	703	D1890-81	p. 79.
5. (a) Radium Total pCi per liter	Proportional counter	903.0	705	D2460-70	
(b) ^{226}Ra, pCi per liter	Scintillation counter	903.1	706	D3454-79	p. 81.

Table IE Notes:

[1] "Prescribed Procedures for Measurement of Radioactivity in Drinking Water," EPA-600/4-80-032 (1980), U.S. Environmental Protection Agency, August 1980.

[2] Fishman, M.J. and Brown, Eugene, "Selected Methods of the U.S. Geological Survey of Analysis of Wastewaters," U.S. Geological Survey, Open-File Report 76-177 (1976).

[3] The method found on p. 75 measures only the dissolved portion while the method on p. 78 measures only the suspended portion. Therefore, the two results must be added to obtain the "total".

(b) The full texts of the methods from the following references which are cited in Tables IA, IB, IC, ID, and IE are incorporated by reference into this regulation and may be obtained from the sources identified. All costs cited are subject to change and must be verified from the indicated sources. The full texts of all the test procedures cited are available for inspection at the Environmental Monitoring Systems Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, 26 West Martin Luther King Dr., Cincinnati, OH 45268 and the Office of the Federal Register, room 8301, 1110 L Street, NW., Washington, DC 20408.

References, Sources, Costs, and Table Citations:

(1) The full text of Methods 601–613, 624, 625, 1624, and 1625 are printed in appendix A of this part 136. The full text for determining the method detection limit when using the test procedures is given in appendix B of this part 136. The full text of Method 200.7 is printed in appendix C of this part 136. Cited in: Table IB, Note 5; Table IC, Note 2; and Table ID, Note 2.

(2) "Microbiological Methods for Monitoring the Environment, Water and Wastes," U.S. Environmental Protection Agency, EPA-600/8-78-017, 1978. Available from: ORD Publications, CERI, U.S. Environmental Protection Agency, Cincinnati, Ohio 45268. Table IA, Note 2.

(3) "Methods for Chemical Analysis of Water and Wastes," U.S. Environmental Protection Agency, EPA-600/4-79-020, March 1979, or "Methods for Chemical Analysis of Water and Wastes," U.S. Environmental Protection Agency, EPA-600/4-79-020, Revised March 1983. Available from: ORD Publications, CERI, U.S. Environmental Protection Agency, Cincinnati, Ohio 45268, Table IB, Note 1.

(4) "Methods for Benzidine, Chlorinated Organic Compounds, Pentachlorophenol and Pesticides in Water and Wastewater," U.S. Environmental Protection Agency, 1978. Available from: ORD Publications, CERI, U.S. Environmental Protection Agency, Cincinnati, Ohio 45268, Table IC, Note 3; Table D, Note 3.

(5) "Prescribed Procedures for Measurement of Radioactivity in Drinking Water," U.S. Environmental Protection Agency, EPA–600/4–80–032, 1980. Available from: ERD Publications, CERI, U.S. Environmental Protection Agency, Cincinnati, Ohio 45268. Table IE, Note 1.

(6) "Standard Methods for the Examination of Water and Wastewater," Joint Editorial Board, American Public Health Association, American Water Works Association, and Water Pollution Control Federation, 17th Edition, 1989. Available from: American Public Health Association, 1015 Fifteenth Street, NW., Washington, DC 20036. Cost: $90.00. Tables IA, IB, and IE.

(7) Ibid, 15th Edition, 1980. Table IB, Note 30; Table ID.

(8) Ibid, 14th Edition, 1975. Table IB, Notes 17 and 27.

(9) Ibid, 13th Edition, 1971. Table IB, Note 31.

(10) "Selected Analytical Methods Approved and Cited by the United States Environmental Protection Agency," Supplement to the 15th Edition of Standard Methods for the Examination of Water and Wastewater, 1981. Available from: American Public Health Association, 1015 Fifteenth Street NW., Washington, DC 20036. Cost available from publisher. Table IB, Note 10; Table IC, Note 6; Table ID, Note 6.

(11) "Annual Book of Standards—Water," Section 11, Parts 11.01 and 11.02, American Society for Testing and Materials, 1991. 1916 Race Street, Philadelphia, PA 19103. Cost available from publisher. Tables IB, IC, ID, and IE.

(12) "Methods for Collection and Analysis of Aquatic Biological and Microbiological Samples," edited by Britton, L.J. and P.E. Greason, Techniques of Water Resources Investigations, of the U.S. Geological Survey, Book 5, Chapter A4 (1989). Available from: U.S. Geological Survey, Denver Federal Center, Box 25425, Denver, CO 80225. Cost: $9.25 (subject to change). Table IA.

(13) "Methods for Determination of Inorganic Substances in Water and Fluvial Sediments," by M.J. Fishman and Linda C. Friedman, Techniques of Water-Resources Investigations of the U.S. Geological Survey, Book 5 Chapter A1 (1989). Available from: U.S. Geological Survey, Denver Federal Center, Box 25425, Denver, CO 80225. Cost: $108.75 (subject to change). Table IB, Note 2.

(14) "Methods for Determination of Inorganic Substances in Water and Fluvial Sediments," N.W. Skougstad and others, editors. Techniques of Water-Resources Investigations of the U.S. Geological Survey, Book 5, Chapter A1 (1979). Available from: U.S. Geological Survey, Denver Federal Center, Box 25425, Denver, CO 80225. Cost: $10.00 (subject to change). Table IB, Note 8.

(15) "Methods for the Determination of Organic Substances in Water and Fluvial Sediments," Wershaw, R.L., et al, Techniques of Water-Resources Investigations of the U.S. Geological Survey, Book 5, Chapter A3 (1987). Available from: U.S. Geological Survey, Denver Federal Center, Box 25425, Denver, CO 80225. Cost: $0.90 (subject to change). Table IB, Note 24; Table ID, Note 4.

(16) "Water Temperature—Influential Factors, Field Measurement and Data Presentation," by H.H. Stevens, Jr., J. Ficke, and G.F. Smoot, Techniques of Water-Resources Investigations of the U.S. Geological Survey, Book 1, Chapter D1, 1975. Available from: U.S. Geological Survey, Denver Federal Center, Box 25425, Denver, CO 80225. Cost: $1.60 (subject to change). Table IB, Note 32.

(17) "Selected Methods of the U.S. Geological Survey of Analysis of Wastewaters," by M.J. Fishman and Eugene Brown; U.S. Geological Survey Open File Report 76–77 (1976). Available from: U.S. Geological Survey, Branch of Distribution, 1200 South Eads Street, Arlington, VA 22202. Cost: $13.50 (subject to change). Table IE, Note 2.

(18) "Official Methods of Analysis of the Association of Official Analytical Chemicals", Methods manual, 15th Edition (1990). Price: $240.00. Available from: The Association of Official Analytical Chemists, 2200 Wilson Boulevard, Suite 400, Arlington, VA 22201. Table IB, Note 3.

(19) "American National Standard on Photographic Processing Effluents," April 2, 1975. Available from: American National Standards Institute, 1430 Broadway, New York, New York 10018. Table IB, Note 9.

(20) "An Investigation of Improved Procedures for Measurement of Mill Effluent and Receiving Water Color," NCASI Technical Bulletin No. 253, December 1971. Available from: National Council of the Paper Industry for Air and Stream Improvements, Inc., 260 Madison Avenue, New York, NY 10016. Cost available from publisher. Table IB, Note 18.

(21) Ammonia, Automated Electrode Method, Industrial Method Number 379–75WE, dated February 19, 1976. Technicon Auto Analyzer II. Method and price available from Technicon Industrial Systems, Tarrytown, New York 10591. Table IB, Note 7.

(22) Chemical Oxygen Demand, Method 8000, Hach Handbook of Water Analysis, 1979. Method price available from Hach Chemical Company, P.O. Box 389, Loveland, Colorado 80537. Table IB, Note 14.

(23) OIC Chemical Oxygen Demand Method, 1978. Method and price available from Oceanography International Corporation, 512 West Loop, P.O. Box 2980, College Station, Texas 77840. Table IB, Note 13.

(24) ORION Research Instruction Manual, Residual Chlorine Electrode Model 97–70, 1977. Method and price available from ORION Research Incorporation, 840 Memorial Drive, Cambridge, Massachusetts 02138. Table IB, Note 16.

(25) Bicinchoninate Method for Copper. Method 8506, Hach Handbook of Water Analysis, 1979, Method and price available from Hach Chemical Company, P.O. Box 300, Loveland, Colorado 80537. Table IB, Note 19.

(26) Hydrogen Ion (pH) Automated Electrode Method, Industrial Method Number 378–75WA, October 1976. Bran & Luebbe (Technicon) Auto Analyzer II. Method and price available from Bran & Luebbe Analyzing Technologies, Inc. Elmsford, N.Y. 10523. Table IB, Note 21.

(27) 1,10-Phenanthroline Method using FerroVer Iron Reagent for Water, Hach Method 8008, 1980. Method and price available from Hach Chemical Company, P.O. Box 389 Loveland, Colorado 80537. Table IB, Note 22.

(28) Periodate Oxidation Method for Manganese, Method 8034, Hach Handbook for Water Analysis, 1979. Method and price available from Hach Chemical Company, P.O. Box 389, Loveland, Colorado 80537. Table IB, Note 23.

(29) Nitrogen, Nitrite—Low Range, Diazotization Method for Water and Wastewater, Hach Method 8507, 1979. Method and price available from Hach Chemical Company, P.O. Box 389, Loveland, Colorado 80537. Table IB, Note 25.

(30) Zincon Method for Zinc, Method 8009, Hach Handbook for Water Analysis, 1979. Method and price available from Hach Chemical Company, P.O. Box 389, Loveland, Colorado 80537. Table IB, Note 33.

(31) "Direct Determination of Elemental Phosphorus by Gas-Liquid Chromatography," by R.F. Addison and R.G. Ackman, Journal of Chromatography, Volume 47, No. 3, pp. 421–426, 1970. Available in most public libraries. Back volumes of the Journal of Chromatography are available from Elsevier/North-Holland, Inc., Journal Information Centre, 52 Vanderbilt Avenue, New York, NY 10164. Cost

available from publisher. Table IB, Note 28.

(32) "Direct Current Plasma (DCP) Optical Emission Spectrometric Method for Trace Elemental Analysis of Water and Wastes, Method AES0029," 1986, revised 1991, (with appendix). Applied Research Laboratories, Inc., 24911 Avenue Stanford, Valencia, CA 91355. Table IB, Note 34.

(c) Under certain circumstances the Regional Administrator or the Director in the Region or State where the discharge will occur may determine for a particular discharge that additional parameters or pollutants must be reported. Under such circumstances, additional test procedures for analysis of pollutants may be specified by the Regional Administrator, or the Director upon the recommendation of the Director of the Environmental Monitoring Systems Laboratory—Cincinnati.

(d) Under certain circumstances, the Administrator may approve, upon recommendation by the Director, Environmental Monitoring Systems Laboratory—Cincinnati, additional alternate test procedures for nationwide use.

(e) Sample preservation procedures, container materials, and maximum allowable holding times for parameters cited in Tables IA, IB, IC, ID, and IE are prescribed in Table II. Any person may apply for a variance from the prescribed preservation techniques, container materials, and maximum holding times applicable to samples taken from a specific discharge. Applications for variances may be made by letters to the Regional Administrator in the Region in which the discharge will occur. Sufficient data should be provided to assure such variance does not adversely affect the integrity of the sample. Such data will be forwarded, by the Regional Administrator, to the Director of the Environmental Monitoring Systems Laboratory—Cincinnati, Ohio for technical review and recommendations for action on the variance application. Upon receipt of the recommendations from the Director of the Environmental Monitoring Systems Laboratory, the Regional Administrator may grant a variance applicable to the specific charge to the applicant. A decision to approve or deny a variance will be made within 90 days of receipt of the application by the Regional Administrator.

* * * * *

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Table 3. Analytical Parameters, Preservation and Holding Times

MATRIX -- WATER

Pg. 1

Sample Type(3)	ANALYTICAL PARAMETERS	Volume Required	Analytical Method (1)	Recommended Container (2)	Preservation (2)	Holding Time (2)
	NON-METALS LABORATORY					
	Acidity	100 ml.	sm402	P,G	Cool 4°C.	14 d.
	Alkalinity	100 ml.	sm403	P,G	Cool 4°C.	14 d.
	BOD 5	1000 ml.	sm507	P,G	Cool 4°C.	48 h.
	Carbonaceous BOD 5	1000 ml.	sm507(5.e.6)	P,G	Cool 4°C.	48 h.
CBP	COD	50 ml.	a-0-1252-83	P,G	Cool 4°C + H2SO4 to pH<2	28 d.
	Bromate	25 ml.	300.0	P,G	Cool 4°C.	28 d.
	Bromide	25 ml.	300.0	P,G	Cool 4°C.	28 d.
	Chlorate	25 ml.	300.0	P,G	Cool 4°C.	28 d.
	Chloride	25 ml.	300.0 (v)	P,G	Cool 4°C.	28 d.
	Chloride	100 ml.	sm407B	P,G	Cool 4°C.	28 d.
Gr	Chlorine	F	sm408E	P,G	None	AI
	Chlorite	25 ml.	300.0	P,G	Cool 4°C.	AI
	Color (Platinum Cobalt)	500 ml.	sm204A	P,G	Cool 4°C.	48 h.
	Color (ADMI)	500 ml.	sm204D	P,G	Cool 4°C.	48 h.
	Conductivity	F	sm205	P,G	Cool 4°C.	28 d.
gr	Cyanates	500 ml.	sm412K	P,G	Cool 4°C., NaOH to pH>12	14 d.
Gr	Cyanide, Total	2x 1000 ml.	sm412D	P,G	Cool 4°C., NaOH to pH>12, + 0.6 g. Ascorbic acid (7)	14 d.
Gr	Cyanide, Free	2x 1000 ml.	sm412H	P,G	Cool 4°C., NaOH to pH>12	14 d.
Gr	Cyanide, amenable to chlorination	2x 1000 ml.	sm412F	P,G	Cool 4°C., NaOH to pH>12, + 0.6 g. Ascorbic acid (7)	14 d.
gr	Dissolved oxygen, probe	F	360.1	G	None	AI
gr	Dissolved oxygen, Winkler	300 ml.	360.2	G	2 ml MnSO4, then 2 ml alkaline iodide-azide, store in dark	8 h.
	Fluoride	500 ml.	sm413B	P	Cool 4°C.	28 d.
	Hardness - EDTA Titr. (9)	100 ml.	sm314B	P,G	Cool 4°C., H2SO4 to pH<2	6 M.
Gr	Oil and Grease	1000 ml.	sm503A	G,T(11)	Cool 4°C., HCl or H2SO4 to pH<2	28 d.
Gr	pH	F	sm423	P,G	None	AI
Gr	Phenols, Total (5)	2x 1000 ml.	420.1	G,T(11)	Cool 4°C + H2SO4 to pH<2	28 d.
	Salinity	F	sm210A	P,G	Cool 4°C.	28 d.
	Solids, total dissolved	100 ml.	gs1-1750-84	P,G	Cool 4°C.	48 h.
	Solids, total suspended	1000 ml.	gs1-3765-84	P,G	Cool 4°C.	7 d.
	Solids, total	100 ml.	gs1-3750-84	P,G	Cool 4°C.	7 d.
	Solids, fixed & volatile	100 ml.	160.4	P,G	Cool 4°C.	48 h.
	Solids, settleable	1000 ml.	sm209A	P,G	Cool 4°C.	48 h.
	Sulfate	100 ml.	300.0 (v)	P,G	Cool 4°C.	28 d.
gr	Sulfide	1000 ml.	sm427D	P,G	Cool 4°C., 40 drops 2N ZnAc sol. + NaOH to pH>9	7 d.
gr	Sulfide	F	-	P,G	None	AI
gr	Sulfite	100 ml.	377.1	P,G	None	AI
	Surfactants - MBAS	250 ml.	425.1	P,G	Cool 4°C.	48 h.
Gr	Temperature	F	170.1	-	None	AI
CBP	Total organic carbon	50 ml.	sm505B	P,G	Cool 4°C.+ H2SO4 to pH<2	28 d.
	Turbidity	100 ml.	sm214A	P,G	Cool 4°C.	48 h.

T = Teflon cap liner
P = Polyethylene
G = Glass
F = Field procedure

v = variance to method
AI = Analyze immediately
CBP = No pH adjustment for Chesapeake Bay Program

Gr = Grab Samples are required.
gr = Grab samples are recommended.

TB3PCHT1
Update: 6/28/91

Table 3. Analytical Parameters, Preservation and Holding Times

MATRIX -- WATER

Pg. 3

Sample Type(3)	ANALYTICAL PARAMETERS	Volume Required	Analytical Method (1)	Recommended Container (2)	Preservation (2)	Holding Time (2)
	NUTRIENTS LABORATORY					
	Ammonia	50 ml.	350.1	P,G	Cool 4°C + H2SO4 to pH<2	28 d.
	Total Kjeldahl nitrogen	50 ml.	351.2	P,G	Cool 4°C + H2SO4 to pH<2	28 d.
	Nitrate	25 ml.	352.1	P,G	Cool 4°C.	48 h.
	Nitrate + nitrite	25 ml.	353.2	P,G	Cool 4°C + H2SO4 to pH<2	28 d.
	Nitrite	25 ml.	353.2	P,G	Cool 4°C.	48 h.
	Organic nitrogen	NRR	sm420A	P,G	Cool 4°C + H2SO4 to pH<2	48 h.
	Phosphate, Ortho-	25 ml.	365.1	P,G	Filter, Cool 4°C.	48 h.
	Phosphorus, Total	50 ml.	365.4	P,G	Cool 4°C + H2SO4 to pH<2	28 d.
	Phosphorus, Total, low level	50 ml.	365.4	P,G	Cool 4°C + H2SO4 to pH<2	28 d.
	Silica, dissolved	25 ml.	sm425C	P	Cool 4°C.	28 d.
	MICROBIOLOGY LABORATORY					
Gr	Fecal coliform-MPN	100 ml.	sm908c	P,G(8)	Cool 4°C., 0.008% Na2S2O3, (6)	6h./30 h.(C)
Gr	Fecal coliform-MF	100 ml.	sm909c	P,G(8)	Cool 4°C., 0.008% Na2S2O3, (6)	6h./30 h.(C)
Gr	Total coliform-MPN	100 ml.	sm908a	P,G(8)	Cool 4°C., 0.008% Na2S2O3, (6)	6h./30 h.(C)

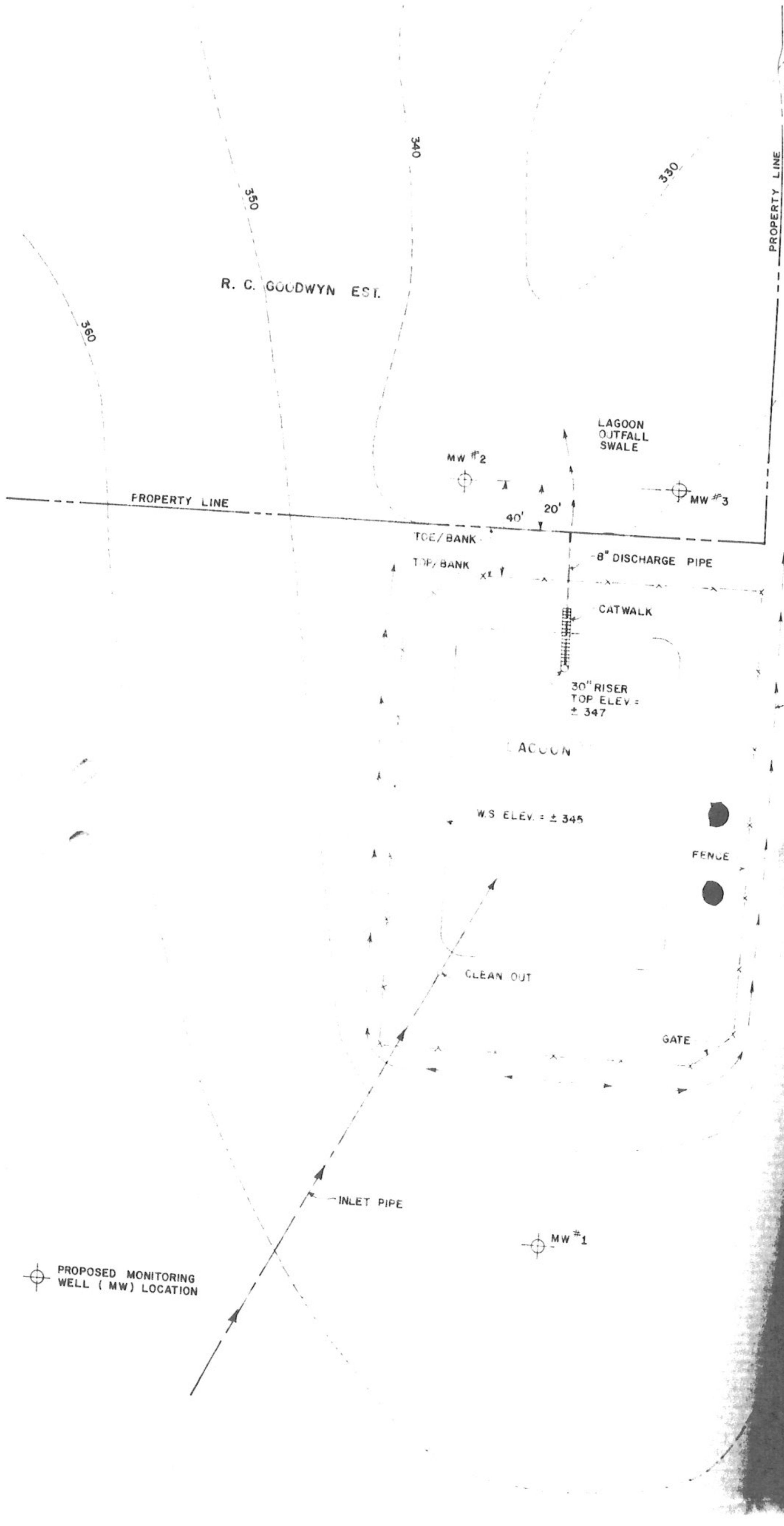
MATRIX -- WATER -- PRIORITY POLLUTANTS --

	VOLATILE (PURGEABLE) ORGANIC COMPOUNDS/PETROLEUM LABORATORY					
gr	Purgeable Organic Compounds Trip blank required.	2x40 ml	624	G (T)	Cool 4°C., 0.008% Na2S2O3, (6)	14 d.
gr	Purgeable Aromatic Compounds Trip blank required.	2x40 ml	624	G (T)	Cool 4°C., Add HCl to pH<2, 0.008% Na2S2O3, (6)	14 d. 14 d.
gr	Petroleum Identification and quantification	250 ml	DCLS3-426	G(A)(T)	Cool 4°C., Add HCl to pH<2, and 0.008% Na2S2O3, (6)	14 d.
	+ volatile aromatic components	+ 40 ml (sample prep SW5030)	SW8021	G (T)	Cool 4°C., Add HCl to pH<2, and 0.008% Na2S2O3, (6)	14 d.
gr	Petroleum Identification (pure product)	40 ml		G (T)	Cool 4°C	14 d.
gr	Total Petroleum Hydrocarbons	1 L.	418.1	G(A)(T)	Cool 4°C., 0.008% Na2S2O3, (6)	14 d.
	Glycol	100 ml	DCLS3-479	G (T)	none required	Undeter. (S)
	EXTRACTABLE ORGANICS LABORATORY					
	Base/Neutrals and Acids	2x 1 L.	625	G(A)(T)	Cool 4°C., 0.008% Na2S2O3, (6)	7 d.
	Tributyltin	2x 1 L.	DCLS3-483	Polycarbonate	Cool 4°C	ASAP
	PESTICIDES IN WATER LABORATORY					
	Herbicides	1 L.	sm509B	G (T)	Cool 4°C., pH 5-9, (4)	7 d.
	Pesticides	2x 1 L.	608	G (T)	Cool 4°C., pH 5-9, (4) 0.008% Na2S2O3 for aldrin	7 d.
	PESTICIDE RESIDUE LABORATORY					
	Chlordecone (Kepone)	250 ml	DCLS3-134	G (T)	Cool 4°C	Undetermined

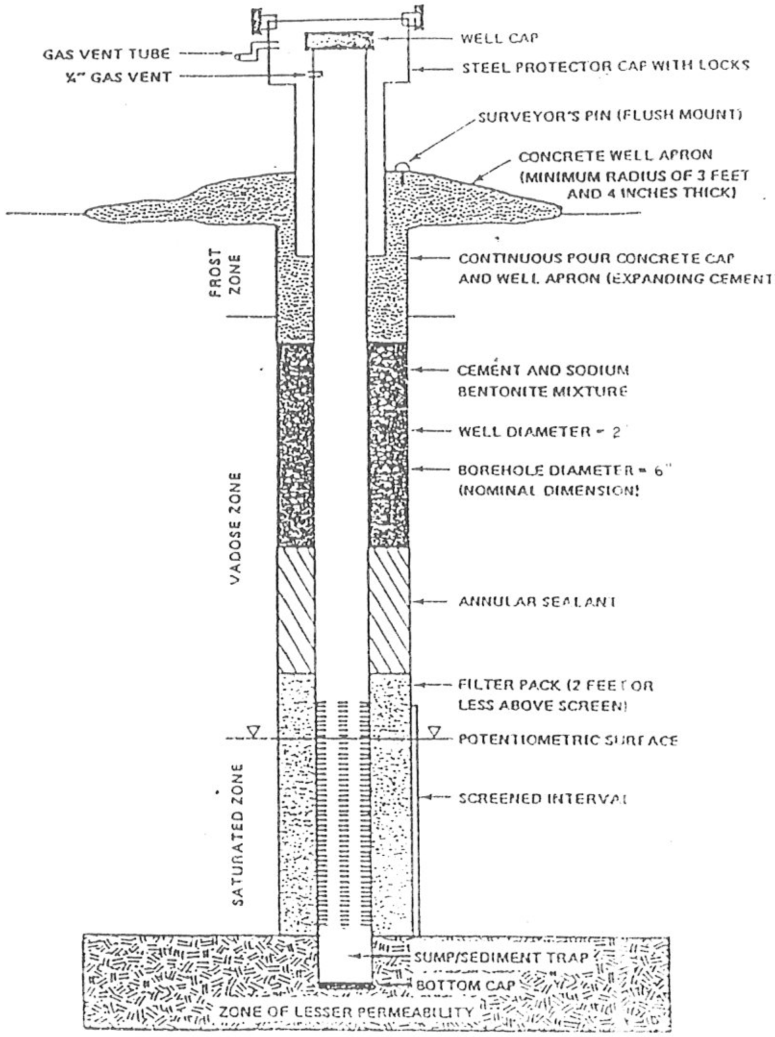
Gr = Grab Samples are required.
gr = Grab samples are recommended.
C = A 30 hr. holding time is permitted only on Ambient Monitoring samples. Legals samples have a maximum 6 hr. holding time.

T = Teflon cap liner
G = Glass
A = amber glass
S = Sample is stable indefinitely. Undetermined holding time.

NRR = Not routinely run
P = Polyethylene



R. C. GOODWYN EST.
360
350
340
330
PROPERTY LINE
PROPERTY LINE
LAGOON OUTFALL SWALE
MW #2
MW #3
40'
20'
TOE/BANK
TOP/BANK
8" DISCHARGE PIPE
CATWALK
30" RISER TOP ELEV = ± 347
LAGOON
W.S ELEV. = ± 345
FENCE
CLEAN OUT
GATE
INLET PIPE
MW #1
PROPOSED MONITORING WELL (MW) LOCATION



NOTE: MONITORING WELL DIAMETER
SHALL BE MIN. 2"

GENERAL MONITORING WELL - CROSS SECTION

Attachment 7 – Stream Sanitation Analysis

MEMORANDUM

State Water Control Board

North Hamilton Street P. O. Box 11143 Richmond, VA 23230

SUBJECT: Huguenot Academy, Powhatan County

TO: G. H. Whitaker

FROM: C. T. Bathala C. T. Bathala

DATE: July 15, 1977

COPIES: BAT, File

STREAM SANITATION ANALYSIS

PROPOSED DISCHARGE

Process:

Hydraulic Load	0.004	MGD		
Raw Sewage BOD_5		mg/l;		lbs/day
Degree of Treatment		%		
Final Effluent BOD_5		mg/l;		lbs/day

RECEIVING STREAM

Name: Unnamed Tributary to Branch Creek
Basin: James River
Sub-Basin: Middle James

2-10 a

Stream Uses (Subclass A): Waters generally satisfactory for use as public or municipal water supply, secondary contact recreation, propagation of fish and aquatic life, and other beneficial uses.

III-A

Special Standards: Coliform Organisms - Fecal coliforms (multiple-tube fermentation or MF count) not to exceed a log mean of 1000/100 ml. No to equal or exceed 2000/100 mg. in more than 10% of samples.

Public Water Supply: Monthly average value not more than 5000/100 ml. (MPN or MF count). Not more than 5000 MPN/100 ml. in more than 20% of samples in any month. Not more than 20,000/100 ml. in more than 5% of such samples.

Stream Standards:

Minimum D.O. 4.0 mg/l   Daily Average 5.0 mg/l
pH Range 6.0-8.5
Temperature 90°F Maximum
5°F Rise Above Natural.

Comments: Sage point occurs in the upper reaches of Branch Creek. Hence, the effect of this discharge on public water supply is negligible.

EFFLUENT LIMITS:

1. BOD_5 - 30 mg/l
2. Suspended Solids - 30 mg/l
3. D.O. - 5.0 mg/l
4. Flow - 4,000 gpd

Non-degradation policy of the Law (memo dated September 9, 1971, from LGL) was applied.

If the plant meets the above requirements, the water quality standards will be maintained.

sw